DOCUMENT RESUME

ED 208 940 PS 012 333

AUTHOR Wilkinson, Paul F.; Lockhart, Robert
TITLE Safety in Children's Formal Play Environments.
SPONS AGENCY Ontario Ministry of Culture and Recreation, Toronto.; Ontario Recreation Society, Toronto.
PUB DATE Mar 76
NOTE 119p.

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Accident Prevention; *Accidents; Design Requirements; Equipment; Equipment Evaluation; Injuries; *Legal Responsibility; *Playgrounds; Research Problems; Risk; *Safety; Safety Education

ABSTRACT

This study was designed to examine the issue of the safety of children's formal play environments. Safety was defined in terms of morbidity and mortality data. Protection and safety education were considered the prime factors in accident prevention while the goal of a safety program was considered to be the minimizing of injuries. Several data gathering techniques were used: in-depth personal interviews with persons planning and providing playgrounds; telephone interviews with similar personnel in other agency settings and in the federal government; letters requesting the assistance of recreation researchers and personnel; examination of accident records; review of literature on safety; and review of literature on legal responsibility. Accidents attributable to playground equipment were found to account for less than 2 per cent of all children's accidents and to account for very few deaths. Many accidents listed as playground accidents were found to be unrelated to playgrounds per se. Few accidents were attributable to equipment problems, although certain types of swinging equipment were associated with a significant increase in accidents. Surface materials were the most serious causal factors in playground accidents. It is strongly suggested that performance standards for playground equipment be adopted. Recommendations regarding liability and suggestions for further research are given. (Author/DB)

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Safety in children's formal play environments

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A report prepared for the Creative Play Committee of the Ontario Recreation Society and for the Ontario Ministry of Culture and Recreation, Toronto, 1976

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Rep. 3/77/2M

Ontario
Ministry of Culture and Recreation
Sports and Fitness Division
Hon. Robert Welch Minister
Robert Johnston Deputy Minister

ACKNOWLEDGEMENTS

A great many people have been instrumental in making this research possible. We would like to express our thanks to all of those people and organizations listed in the Appendix who have been so generous with their time and effort.

A number of special notes of appreciation, however, are warranted: Bill Knott, of the Ontario Ministry of Culture and Recreation, who made this project possible; Bill Thorsteinson, of the Ontario Recreation Society who was our sponsor; Neil Melman and the other members of the Creative Play Committee of the Ontario Recreation Society for their encouragement; and Ken Balmer and Doug Crapo, of Balmer, Crapo and Associates, Ltd., for their cooperation. The research would not have been possible without the help of Steve Hiley and Dave Murray who acted as research assistants and of Joyce Ames, Sue Shewchuk and Alice Reppert for typing the report.

Finally, thanks must go to Doh and Chris and to Donna for putting up with us.

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INTRODUCTION

> It is regrettable but true that it takes a major human tragedy to stimulate interest in safety. Such an accident occurred at Battersea last June when five young children were killed and several were seriously injured on the Big Dipper -- I contend, however, that far more children are killed or seriously injured every day of the year in their neighbourhood playground. Some will dismiss this comment as pure sensationalism but unfortunately it is not. I have heard so many horrifying accounts of playground accidents during the last 8 years that I feel compelled to highlight this situation and demand higher standards of safety, design and maintenance for playground equipment.
>
> National statistics on playground and accidents are unobtainable....(McNair n.d., p. 4).

There is evidence to suggest that many recreation and education personnel and parents believe that large numbers of children are being seriously injured in formal play environments. McNair's comment above is indicative of such views. The purpose of this study is to investigate children's formal play environments in public settings in an attempt to answer a basic question: are children's play environments safe? The original mandate for the project was to compare the safety of adventure and creative playgrounds as opposed to traditional playgrounds. As suspected, however, it did not prove possible to address this more specific problem in other than a preliminary fashion, simply because data on this topic have not been gathered and/or are not readily available. The purpose of the study was, therefore, broadened to the examination of the issue of the safety of children's formal play environments in general.

A number of problems were evident from the beginning of the project. First was the meaning of "safety" and the unit of measurement of safety. It was decided that safety would be described in terms of accidents (as defined by morbidity and mortality data). Second, there was a problem in separating playground-related accidents (i.e., those related to the design of the apparatus,

siting, surface materials, the interaction of users and equipment etc.) from non-playground-related accidents (i.e., those accidents occurring on playgrounds, but which are not related to either the design or use of playground equipment). The latter included accidents related to sports, vandalism, poor maintenance (e.g., broken glass), bicycles, etc. Third, there was the problem of unavailability, incompleteness or unreliability of much of the necessary data. Some agencies refused to cooperate, or made available the data in such a way that it was not useful. In other cases, complete records have not been kept, while in still others there is an obvious degree of unreliable or questionable data, often gathered in an unscientific manner. For example, summary statistics often list a certain number of accidents of a particular type, but examination of detailed reports indicates great variation in the quality of the reporting of such "accidents". Fourth, there is no common format for gathering or reporting data. For example, little information is often available on the nature of the accidents (e.g., location, type of environment, causes). Fifth, obviously data are available only for those accidents which are recorded by either playground or hospital personnel. Many minor accidents are never recorded and probably some serious accidents are not attributed in recording to playgrounds.

Despite these problems, however, enough data were available to arrive at a number of conclusions and to make some recommendations.

RESEARCH DESIGN

Because of time and economic constraints, original research was not possible. A number of techniques were, therefore, used to gather data:

(a) in-depth personal interviews with personnel in agencies planning and providing for children's play environments in Ontario, in general, and in the Metropolitan Toronto area, in particular;

(b) telephone interviews with other similar personnel throughout Ontario and with the federal government;

(c) letters requesting the assistance of recreation researchers and personnel in every province, a number of major cities in Canada, the United States, and Europe;

(d) examination of accident records of a number of municipal and educational agencies;

(e) examination of the literature on safety;

(f) examination of the literature on liability.

The latter area, the question of legal responsibility, was added to the study in order to place accidents in a legal perspective.

DEFINITIONS OF TYPES OF CHILDREN'S FORMAL PLAY ENVIRONMENTS

There are three basic types of children's formal play environments in public settings:

Traditional Playground - a formal playground (in the sense of a man-made, built environment designed specifically for children) characterized by metal apparatus, set in asphalt or sand and highly specialized in terms of limited functions.

Creative Playground - a formal playground characterized by apparatus that is designed and created from materials that are more "natural" (e.g., wood, stone, brick, hills); it is "creative" in the sense of using more natural materials, while at the same time attempting to offer a wider choice and range of alternatives by means of more abstract design.

Adventure Playground - a playground often labelled a "junk" playground, in which children under supervision are given the opportunity to take part in a variety of self-directed activities (e.g. constructing huts and forts using materials and tools provided at the playground, lighting fires and cooking, camping, keeping animals). (Adapted from D. Lockhart, 1974)

THE PURPOSE OF FORMAL PLAY ENVIRONMENTS

It is not part of the mandate of this study to justify the existence of formal play environments, nor to argue for one type of environment over another. As McConnell et al. (1973, p. 19) indicate, however, it is necessary to examine more than statistics in order to begin to understand the issue of safety:

> It becomes obvious that the task of keeping them [children] safe from injury is no simple undertaking. It is one which must encompass not only the control of the physical characteristics of the equipment but a full understanding of the motivational makeup of the child, his needs, his desires, his physical limits and his propensities.

These issues are, obviously, complex and will not be dealt with in detail here. It is sufficient at this point merely to clarify the positive values of a well-designed play environment:

1. a stage setting for imaginative play;
2. an aid to muscular development;
3. an aid to perceptual development;
4. a means of developing self-confidence through mastery of particular pieces of equipment; and
5. a locus for peer interaction and social development

(National Recreation and Park Association 1976a, p. 84).

In creating an environment to fulfill such purposes, one obviously presents certain elements that have potential danger. The problem is to minimize such dangers without destroying the usefulness and integrity of the play environment.

THE ISSUE OF SAFETY

There are two prime factors in accident prevention in any setting: protection and education. There is an obvious reciprocal relationship between these two (McConnell et al. 1973, p. 28). As the effectiveness of user education increases, the necessity for protection decreases. It is important to note, however, that some degree of protection is always necessary; the problem is the degree of protection.

When dealing with children and their play environments, emphasis must be placed on protection. Safety education is also important, but it decreases in effectiveness the younger the child. To repeat a homily, children are not careless; they are care-free. It is, therefore, the duty and responsibility of those agencies providing formal play environments to protect children from sources of danger. As McConnell et al. (1973, p. 20) note,

> It is evident that the elementary child is not always the master of his fate on the playground and that many individuals do indeed hold the responsibility for his safety and well being during these formative years.

It is possible to create an environment which is almost perfectly safe simply by avoiding risk. The problem is, however, that such a setting would not make a good play environment because it would lack many of those elements necessary for meaningful play: variety, complexity, challenge, risk, flexibility, adaptability, etc. Quite simply, such a playground would go largely unused. Indeed, this is the case with many of the traditional playgrounds now in existence. They are not being heavily used because children do not like them; they are neither fun nor challenging. Incidently, this also gives them the appearance of being safe. Few accidents are reported because few children use them. As a result, no meaningful or definitive statements can be made about accident rates.

There are two goals in any safety programme. The first is to eliminate serious types of injuries, e.g., strangulations, skull fractures, concussions, and causes of death or dismemberment. The second is to minimize other minor types of injuries, e.g., broken bones, abrasions, lacerations, punctures, etc. There are a number of ways to meet these goals. The first is to eliminate obvious sources of danger, e.g., sharp edges, protrusions and hard surface materials. The second is to construct equipment from safe, durable materials. The third is to maintain and install the equipment properly. The fourth is educate the children about safety and to supervise them where necessary. Finally, performance standards should be adopted which apply to all playground equipment. The emphasis should be placed on performance rather than design standards so that the focus is on hazards rather than specific pieces of equipment. In this way, once a safety requirement (e.g., abrasive qualities) is established, it can apply to any given situation (National Recreation and Park Association 1976a, p. 1).

Such standards must be aimed at both normal use patterns and anticipated misuse patterns. Examples of anticipated misuse include the following: user overload; pushing, shoving and general "horseplay"; running up slides; climbing on top of guard rails, supports, etc.; head-first sliding; hanging by the feet from climbing equipment; penetrating openings; etc. (National Recreation and Park Association 1976a, p. 20). There has not been a great deal of research on use patterns and it is an area which merits further study.

ACCIDENTS IN CHILDREN'S PLAY ENVIRONMENTS

Overview of children's accidents

There is no denying the fact that children do have accidents on playgrounds, but then children have accidents in many places and in many ways. It would seem appropriate, therefore, to put playground accidents into perspective by examining the overall picture of children's accidents. (For obvious reasons, non-accident related morbidity and mortality data are not examined.)

The Toronto Sick Children's Hospital (Haffey 1974, 1975) maintains detailed records on children's accidents (although these data are not broken down by location, e.g. public park or home). Table 1 presents data on causes of all accident cases recorded at the hospital for 1973 and 1974, while Table 2 ranks the major causes of accidents. From a mortality point of view, transport (e.g., automobiles, bicycles) and foreign body (e.g., swallowing solid objects, food, vomit) accidents are the most serious causative factors, accounting for a total of 66.7% and 84.6% of all accident deaths at the hospital for 1973 and 1974, respectively. The picture changes somewhat for morbidity data, i.e., total cases and admissions. Transport and foreign bodies are major causative factors, but less fatal factors -- falls, bumps and blows, cutting/piercing -- dominate.

Playground accidents

Causes of accidents

The two major categories of causative factors for playground-related accidents are falls, and bumps and blows. Table 3 presents a detailed breakdown of accidents related to playground equipment by type of equipment as compared to all causative agents, recorded at the Toronto Hospital for Sick Children for 1973 and 1974. As can be seen, there were no deaths as a result of accidents

Table 1 Toronto Sick Children's Hospital: Summary of Accidents, 1973 and 1974

CAUSE	NUMBER (AND PERCENTAGE OF TOTALS) TOTAL CASES*		ADMITTED		DIED	
	1973	1974	1973	1974	1973	1974
Transport	1429 (7.6)	1537 (9.1)	342 (20.1)	348 (21.1)	9 (33.3)	6 (23.1)
Accidental poisonings	761 (4.0)	674 (4.0)	101 (5.9)	85 (5.2)	1 (3.7)	0
Falls	5754 (30.4)	5629 (33.3)	548 (32.1)	543 (32.9)	2 (7.4)	2 (7.7)
Burns, explosions, electrical shock	476 (2.5)	521 (3.1)	93 (5.5)	82 (5.0)	3 (11.1)	0
Natural environmental factors	703 (3.7)	595 (3.5)	42 (2.5)	40 (2.4)	0	1 (3.9)
Foreign Bodies	806 (4.3)	806 (4.8)	145 (8.5)	142 (8.6)	9 (33.3)	16 (61.5)
Bumps and blows	3479 (18.4)	2587 (15.3)	171 (10.0)	162 (9.8)	0	0
Cutting, piercing	1959 (10.4)	2145 (12.7)	94 (5.5)	82 (5.0)	0	0
Machinery	126 (0.7)	97 (0.6)	25 (1.5)	16 (1.0)	0	0
Drowning, submersion, suffocation	8 (0.04)	1 (0.01)	4 (0.2)	1 (0.1)	1 (3.7)	0
Caught in or between objects	602 (3.2)	616 (3.7)	27 (1.6)	33 (2.0)	0	0
Overexertion, strenuous movements	1028 (5.4)	979 (5.8)	10 (0.6)	13 (0.8)	0	0
Other and unspecified	1465 (7.8)	291 (1.7)	31 (1.8)	25 (1.5)	0	0
Sub-totals	18596	16475	1633	1572	25	25
Suicide attempts	66 (0.4)	73 (0.4)	30 (1.8)	22 (1.3)	1 (3.7)	0

Table 1 Toronto Sick Children's Hospital: Summary of Accidents, 1973 and 1974

Purposely inflicted injuries	241 (1.3)	342 (2.0)	43 (2.5)	55 (3.3)	1 (3.7)	1 (3.9)
Legal intervention	3 (0.02)	0	0	0	0	0
Total	18,906 (100.0)	16,890 (100.0)	1706 (100.0)	1649 (100.0)	27 (100.0)	26 (100.0)

Source: Haffey 1974, 1975

*Includes all emergency room cases and admissions

Table 2 Toronto Sick Children's Hospital - Major Cause of Accidents, 1973 and 1974.

RANK	CAUSE		
	Total Cases*	Admitted	Died
1.	Falls	Falls	Transport
2.	Bumps and blows	Transport	Foreign bodies
3.	Cutting, piercing	Bumps and blows	Falls
4.	Transport	Foreign bodies	Burns, explosions, electrical shock.

Source: Haffey 1974, 1975

*Includes all emergency room cases and admissions.

Table 3 Toronto Sick Children's Hospital - Summary of Accidents Related to Playground Equipment, 1973 and 1974

Cause Playground Equipment Related Accidents (as a Fraction and Percentage of Particular Causes)

	Total Cases		Admitted		Died	
	1973	1974	1973	1974	1973	1974
All causes	$\frac{252}{18906}$=1.3%	$\frac{260}{16890}$=1.5%	$\frac{34}{1706}$=2.0%	$\frac{29}{1649}$=1.8%	$\frac{0}{27}$	$\frac{0}{26}$
Falls	$\frac{251}{5754}$=4.4%	$\frac{221}{5626}$=4.0%	$\frac{34}{548}$=6.2%	$\frac{29}{543}$=5.3%	$\frac{0}{2}$	$\frac{0}{2}$
Bumps and blows	$\frac{*}{3479}$	$\frac{31}{2587}$=3.2%	$\frac{*}{171}$	$\frac{*}{162}$	$\frac{0}{0}$	$\frac{0}{0}$
Other causes	$\frac{1}{1465}$=0.1%	$\frac{8}{291}$=2.8%	$\frac{*}{31}$	$\frac{*}{25}$	$\frac{0}{0}$	$\frac{0}{0}$

Source: Haffey 1974, 1975

*Not given in detail

12

on playground equipment in either year. Playground equipment accidents represented 1.5% or less of the total cases and 2.0% or less of admissions for all causes in each of the two years and very low percentages of falls, bumps and blows, and other causes.

In summary, accidents related to playground equipment in total (i.e., in both public and private settings) represent only a small percentage of all children's accidents. From an overall safety point of view, therefore, children's play equipment is not a major problem. Every attempt, however, should be made to understand the causes of those playground accidents that do occur and to minimize them.

Location of accidents

In a detailed study of consumer product accidents for the period June 15 to September 30, 1975 at the Toronto Hospital for Sick Children, Bongers (1975) found that of 122 cases of playground equipment accidents there were 21 (17.2%) in which the equipment was or may have been a causative factor. The location of these 21 accidents is shown in Table 4. More accidents (57.1%) occurred on private property than on public property (38.1%).

Other studies report similar findings. For example, the National Electronic Injury Surveillance System (NEISS) in the United States records about 800,000 injuries per year involving playgrounds (including sports) and requiring at least emergency room treatment; 57% of these accidents occur on "home" equipment (Mahajan 1974, p. 1). Similarly, in a detailed study of 81 accidents, McConnell et al. (1973, p. 9) found that about one-half occurred on private equipment, while the United States Consumer Product Safety Commission (1975, p. 3) estimates the percentage at slightly less than one half.

Care must be taken in interpreting some of the available data on "play-

Table 4 Toronto Sick Children's Hospital: Location of Accidents in Which Playground Equipment was (May Have Been) a Causative Factor, Summer 1975.

Accidents in which Playground Equipment Was (or May Have Been) a Causative Factor

LOCATION	NUMBER	PERCENTAGE
Apartment buildings	7	33.3
Public parks	6	28.6
Private property	5	23.8
School yards	2	9.5
Unknown	1	4.8
Total	21	100.0

Source: Bongers, 1975

ground accidents" as to location. For example, detailed analysis of all accidents from the playground programme of the City of Winnipeg for Summer 1975 indicates that only about one-quarter of the accidents actually were related to playgrounds per se. (See Table 5) The rest were related to swimming pools (where broken glass is a serious problem), sports, and excursions. To confuse the picture even more, the "swimming pool" accidents took place at supervised swimming pools and, therefore, do not include accidents occurring at wading pools in playgrounds.

Adventure and creative playgrounds vs. traditional playgrounds

It is not possible, however, to give any detailed statistics on the type of public playground in which the accidents take place. On one hand, the data do not exist in such detail, while on the other hand there are few creative playgrounds and very few adventure playgrounds in comparison to traditional playgrounds so that comparison would be difficult even if the data did exist. A number of qualitative reports on comparative safety have, however, been found.

In a general comment on adventure playgrounds, Jago (n.d., p. 1) states that:

> An adventure playground is... a safe place....
>
> Now I would like to say something about safety, because it is very much part of all the work. I would sympathize with you if you felt that the towers and three-storey huts appear very risky on the playground, but in fact they appear as risks to us because we tend not to walk around ten or fifteen feet above the ground any more...so we tend to be fearful and clumsy. These structures are not risks in a child's terms because he built them and knows their limits.

The following comment was made about a California adventure playground:

> ...the [adventure playground] area was cleared by our insurance carrier as simply another playground in the city of Huntington Beach [California], as no statistics could

Table 5 City of Winnipeg: All Recorded "Playground Programme Accidents," Summer 1975.

LOCATION/ACTIVITY	NUMBER	PERCENTAGE
Swimming pools	23	54.7
Playgrounds	11	26.2
Sports	5	11.9
Excursions	3	7.1
Total	42	100.0

Source: D. Fletcher, Personal communication, 1975.

> be found to support the general opinion that adventure playgrounds are dangerous. Studies completed at the end of summer of 1974 indicated this to be true. We experienced virtually the same minimal serious accident rates that occur on standard supervised playgrounds. The only exception was that many more minor injuries - such as cuts, scratches, bumps, and bruises - were recorded at the Adventure Playground.
>
> Cities contemplating such a program should be prepared for the inevitability of many, many more minor injuries of the "first aid - continue play variety." Due to the injury record to date, no additional insurance premiums have been warranted or levied (Anonymous, "Adventure playground proves great success," 1975, p. 21).

Commenting on the creative playground at Toronto's Harbourfront, Rhind (1974, p. 21) notes that the "children suffered a few stitches this summer, but nothing that couldn't just as easily have happened at any other playground."

In a series of detailed case studies on creative and adventure playgrounds, the Ontario Ministry of Community and Social Services (1972) makes a number of comments on particular creative and adventure playgrounds:

> Originally, Glencedar [Creative Playground] was heavily criticized by neighbours as being a dangerous place in which to play...
>
> Over the summer, the playground proved itself to be a safe place to play. A lot of unnecessary complaints could have been eliminated if a proper public education [sic] had taken place. Unfortunately, the [Borough of York] Parks and Recreation Department was pressured into completing the playground soon after the funds had been allotted and was unable to meet with various community groups for their ideas and support. The ideas and suggestions of the children would also have been a valuable asset (p. 1).
>
> Duke of York [Adventure Playground] has had no serious accidents to date. Many of the mishaps in the playground were from misuse and unfamiliarity with the tools used: outdoor paint, saws, nails, hammers, etc. With an increase in familiarity [with the tools], the accident ratio has decreased (p. 5).
>
> ...from July 14 to August 27, 1971....1512 children participated in the program [at Ottawa's Wellington Adventure Playground]...the incidence of accidents at this playground was lower than in the traditional playground. Children seem to be more careful when they know that they are

handling tools that are potentially dangerous (pp. 14-15)

In a survey of 157 parents whose children used three of Vancouver's creative/adventure playgrounds[1], Reid (1971) found that only 3% of the responses to a question on the problems of such playgrounds dealt with accidents and all were minor accidents. Similarly, 77% of the parents favoured the playgrounds and only 8% were opposed.

As was noted in the Introduction, care must be taken in interpreting data, but the results of a study done by the Toronto Board of Education are interesting. Six schools with creative playgrounds and six without creative playgrounds were compared in terms of "schoolyard" and total accidents. No information, however, is available in terms of nature and seriousness of the accidents or how "schoolyard" accidents were defined. In the first set of six schools, the numbers of both "schoolyard" and total accidents decreased after creative playgrounds were installed. (See Table 6.) It would have been more interesting to see if these numbers continued to decrease over time. In the second set of six schools without creative playgrounds the rates for "schoolyard" and total accidents increased in the second year. (See Table 7.) For the schools in which creative playgrounds were installed, it could be suggested that the reason for the decreased accident rates was that the creative playgrounds were safer than the original traditional playgrounds. The question arises, however, as to why the accident rates increased on the schools without creative playgrounds. Possible causes are maintenance, deteriorating equipment, less supervision, more complete accident recording, etc. No reasons were provided. It is also important to note that both the "schoolyard" and total accident rates for the schools with creative playgrounds are higher than those for the schools without creative playgrounds;

---

[1] These are not true adventure playgrounds, but a mixture of the elements of adventure and creative playgrounds.

Table 6 Toronto Board of Education: Accidents for Six Schools With Creative Playgrounds.

School	Year 1 (Traditional Playground)*		Year 2 (Creative Playground)**	
	Number of School-yard Accidents	Number of Total Accidents	Number of School-yard Accidents	Number of Total Accidents
1	7	13	4	6
2	26	36	18	29
3	15	28	20	25
4	28	55	30	41
5	28	47	23	39
6	9	18	5	13
Total	113	197	100	153
Number of Accidents/ 100 pupils	3.23	5.63	3.06	4.68

* Number of pupils = 3498

** Number of pupils = 3268

Source: Toronto Board of Education, 1975.

Table 7 Toronto Board of Education: Accidents for Six Schools Without Creative Playgrounds.

School	Year 1 (Traditional Playground)*		Year 2 (Traditional Playground)**	
	Number of School-yard Accidents	Number of Total Accidents	Number of School-yard Accidents	Number of Total Accidents
1	3	5	9	11
2	8	21	6	12
3	49	63	47	66
4	21	53	37	63
5	16	29	11	16
6	5	10	10	14
Total	102	181	120	182
Number of Accidents/ 100 pupils	2.27	4.10	2.87	4.36

* Number of pupils = 4417

** Number of pupils = 4193

Source: Toronto Board of Education, 1975

however, the rates were significantly higher in the former than the latter in the year before the creative playgrounds were installed when all schools had traditional playgrounds. It is also important to note that these data provide information only on accident rates per 100 pupils and not on use rates, that is, comparative information on how heavily used the playgrounds are. For example, a very unsafe environment could have a large number of accidents but few actual users from the overall potential population.

To repeat again, it is obvious that data must be carefully interpreted, but there is some evidence to suggest that the difference in danger between creative and adventure playgrounds and traditional playgrounds is not great.

Seriousness of accidents

A serious injury may be defined as follows:

> Any injury in which, based on medical experience, there is a reasonable chance of prolonged disability or permanent physical damage to the injured party. Some examples of injuries considered "serious" under this definition would be brain damage, fractures, deep laceration, amputation, impalement, loss of eyesight or hearing, and of course any injury leading to death (National Recreation and Park Association 1976b, p. 6).

The question arises, however, as to whether the issue is the seriousness of individual accidents or the rate of serious accidents. For example, the Greater London Council (Great Britain) reports that "20 children were seriously injured in the year ending March 1972" (Anonymous, "Getting to grips with the facts", n.d., p. 8). This number, however, represents only those serious accidents -- "serious" not being defined in the article -- on the 15 playgrounds responsible to the Parks Department. It does not cover those playgrounds managed by individual London Boroughs or those attached to housing estates. To construct a serious accident rate would obviously require a great deal of data: the exact nature of the accidents; numbers of children served by the playgrounds; average

frequency of use; use patterns; etc. Basically, then, all that can be discussed are raw numbers of accidents. The question arises as to how meaningful such numbers are.

As indicated above the most common causes of playground accidents are falls, and bumps and blows. It is not easy to answer the question as to how serious these accidents are. Playground accident reports usually only record those accidents occurring during times when supervision is present and very rarely contain follow-up information. Some reports deal with "accidents", no matter how trivial; for example, in one report from Vancouver a child complained of a cut finger, but the supervisor could see no evidence of one and merely gave the child a band-aid as moral support. Other reports are clearly not dealing with "accidents" in terms of being related to the playground per se; for example, a Vancouver report notes a heart attack of an elderly man sitting near the playground. Table 8 provides another example of the variety of "accidents" on playgrounds, while Tables 9 and 10 show that only a small proportion of all accidents on public playgrounds are related to the equipment itself. The only reliable data would, therefore, appear to be hospital records; however, as noted above, such records often do not give the location (i.e., public or private equipment) of the accident or the seriousness of the accident (except in terms of number of cases actual admissions and deaths).

Data noted above from the Toronto Hospital for Sick Children suggest low morbidity and mortality rates, but more extensive data warrant attention. In particular, the United States Consumer Product Safety Commission (1975) analysed an estimated sample of 117,951 playground equipment-associated injuries as reported by the National Electronic Injury Surveillance System during 1974. Below is a summary of their findings.

Table 8 City of Winnipeg: Nature of All "Recorded" Playground Accidents, Summer 1975

CAUSE	NUMBER	PERCENTAGE
Fell off monkey bars	2	18.2
Hit by another child	2	18.2
Cut foot on glass in wading pool	2	18.2
Fell while playing game	1	9.1
Pushed off swing	1	9.1
Pushed off bicycle	1	9.1
Stubbed toe on pipe in ground	1	9.1
Hit by thrown rock	1	9.1
	11	100.1

Source: D.F. Fletcher, Personal communication, 1975.

Table 9 Vancouver Board of Parks and Recreation: Causative Factor of All Recorded Public Playground Accidents, 1970-1975.*

YEAR	ACCIDENTS (Number and Percentage)		
	Total	Playground Equipment - Related	Not Related to Playground Equipment** and Miscellaneous***
1970	276 (100.0)	29 (10.5)	247 (89.5)
1971	284 (100.0)	12 (4.2)	272 (95.8)
1972	245 (100.0)	15 (6.1)	230**** (93.9)
1973	104 (100.0)	28 (26.9)	76 (73.1)
1974	88 (100.0)	17 (23.0)	74 (77.0)
1975	40 (100.0)	1 (2.6)	39 (97.4)
Total	1037 (100.0)	102 (9.8)	935 (90.2)

Source: L.F. Ryan, Personal communication, 1976

* Data are for all ages for 1970-1972, but only for children under 15 years of age for 1973-1975.

** Includes sports-related accidents.

*** Miscellaneous includes: falls (e.g., bicycles, sports), glass cuts, splinters, stings, etc., plus all unexplained sprains, twists, bruises and broken bones.

**** Includes "2 pig bites".

Table 10 Municipalities of Metropolitan Toronto: Causative Factor of Playground Accidents, 1975.

Municipality	Number (and Percentage) of Accidents		
	Total	Playground-Related	Non-Playground Related
Borough of East York	10 (100.0)	4 (40.0)	6 (60.0)
Borough of Etobicoke	86 (100.0)	6 (7.0)	80 (93.0)
Borough of North York	230 (100.0)	12 (5.2)	218 (94.8)
Borough of Scarborough	44 (100.0)	7 (16.7)	37 (83.3)
Borough of York	31 (100.0)	2 (6.5)	29 (93.5)
City of Toronto	209 (100.0)	12 (5.7)	197 (94.3)
Total	610 (100.0)	43 (7.1)	567 (92.9)

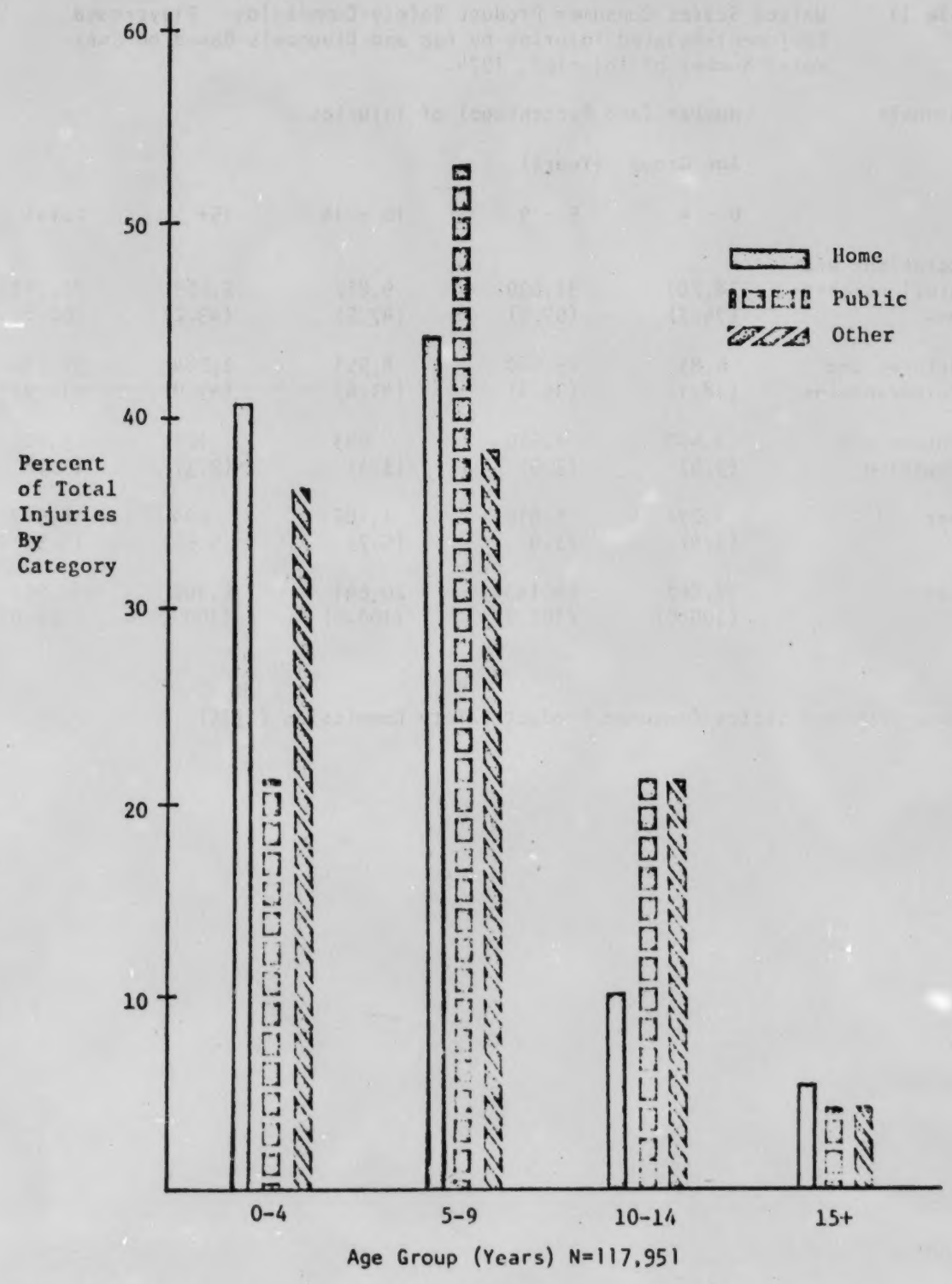
Source: Personal communications, various municipal officials, 1976.

Age and Sex: Seventy-eight percent of the total estimated injuries occurred to children less than 10 years of age. Understandably, children under 4 years of age suffered more injuries on home playground equipment than on public playground equipment. In the age group of 5-9 years, 10% more injuries involved public playground equipment than home playground equipment. Only 5,308 out of the total of 117,951 estimated injuries occurred in the age group of 15 years and over, and these were divided fairly evenly between the types of playground equipment. In the age group of 10-14 years, more than twice as many victims sustained injuries in accidents involving public playground equipment than home playground equipment. Just over half of all persons injured on playground equipment were male. (See Figure 1.)

Age and Diagnosis: Table 11 indicates that among children under 5 years of age lacerations and contusions/abrasions were the predominant diagnoses, together representing 74.7% of the injuries to this age group. Fractures and strains/sprains combined to add another 18.1%. The discrepancy between these two major groups of injury diagnoses decreases with age such that in the age group of 5-9 years, 57.3% of the injuries were lacerations or contusions/abrasions, and 36.3% were fractures or strains/sprains and that in the age group of 10-14 years and 15 years and older groups, the percentages were almost equal for the two types of injury. Hematomas and concussions together represent 3.3% of the injuries and all other diagnoses totalled 3.9%.

Diagnosis and Body Part: The estimated number of injuries associated with playground equipment totalled 117,951. Lacerations, contusions/abrasions, fractures, and strains/sprains comprised 92.8% of the estimated injuries for all playground equipment. Specifically, lacerations accounted for 37.3%; contusions/abrasions, 23.4%; fractures, 22.8%; and strains/sprains, 9.1%. The remaining

Figure 1 United States Consumer Product Safety Commission: Playground Equipment-Associated Injuries By Age As Percent of Total Estimated Injuries, 1974



Source: United States Consumer Safety Commission

Table 11 United States Consumer Product Safety Commission: Playground Equipment-Related Injuries by Age and Diagnosis Based on Estimated Number of Injuries, 1974.

Diagnosis	Number (and Percentage) of Injuries				
	Age Group (Years)				
	0 - 4	5 - 9	10 - 14	15+	Total
Lacerations and contusions/abrasions	28,287 (74.7)	31,030 (57.3)	9,812 (47.5)	2,609 (49.2)	71,743 (60.8)
Fractures and strains/sprains	6,837 (18.1)	19,660 (36.3)	8,951 (43.4)	2,284 (43.0)	37,736 (32.0)
Hematoma and concussion	1,467 (3.9)	1,620 (3.0)	693 (3.4)	121 (2.3)	3,905 (3.3)
Other	1,271 (3.4)	1,830 (3.4)	1,185 (5.7)	294 (5.5)	4,567 (3.9)
Total	37,862 (100.0)	54,140 (100.0)	20,641 (100.0)	5,308 (100.0)	117,951 (100.0)

Source: United States Consumer Product Safety Commission (1975)

were concussions (1.8%); hematomas (1.4%); and other (4.2%). (See Figure 2.)

The head, including the face, eye, ear, mouth, and neck, sustained just under half of the total estimated injuries. The remaining injuries were divided into upper extremities (30%); lower extremities (15%); and trunk (9%).

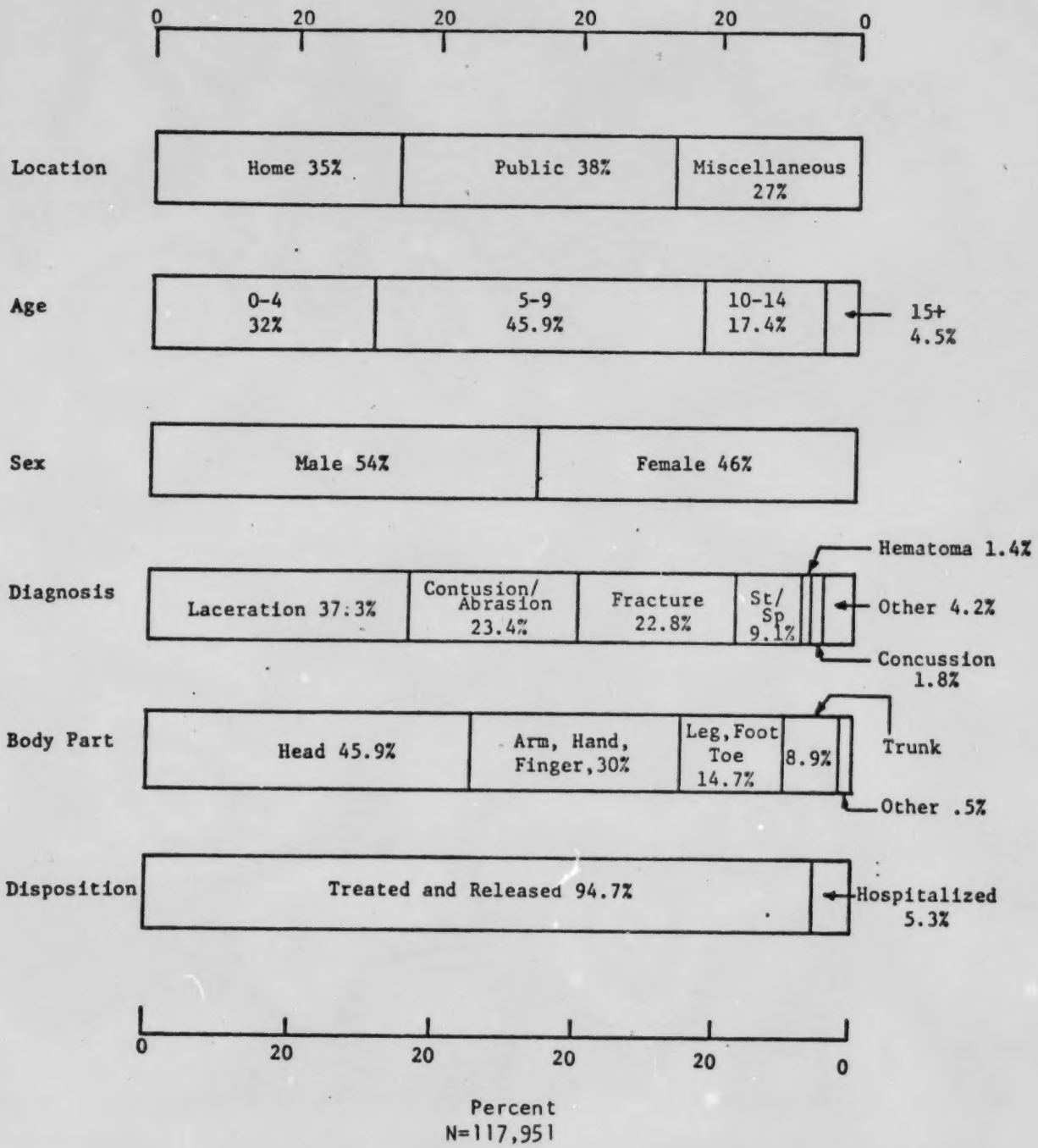
Site of Playground Equipment Injuries: The estimated number of injuries was approximately the same for home and public playground equipment, although percentages differed by equipment type. There were approximately 41,000 home and 45,000 public playground equipment-related injuries treated in hospital emergency rooms throughout the United States. Swings and swing sets constituted the product category involved most frequently in home playground equipment-related injuries, accounting for 70%. In contrast, playground climbing apparatus (35%), slides (28%), and swings and swing sets (21%) were the product categories more frequently involved in public playground injuries. (See Figure 3.)

Disposition and Sex: Just over half of all persons injured in accidents involving playground equipment were male. The rate of hospitalization for playground equipment injuries was 5%.

Deaths: From July 1973 through October 1974, the United States Consumer Product Safety Commission (1975) received 24 death certificates for injuries related to playground equipment. Of these 15 occurred at home and 9 occurred in public settings. Eleven deaths were a direct result of falls. Eight deaths resulted from hanging. Three of the deaths were caused by part of a swing set striking the victim. Of the two remaining deaths, one occurred when a swing set collapsed, and the other resulted from a fall into the swing set.

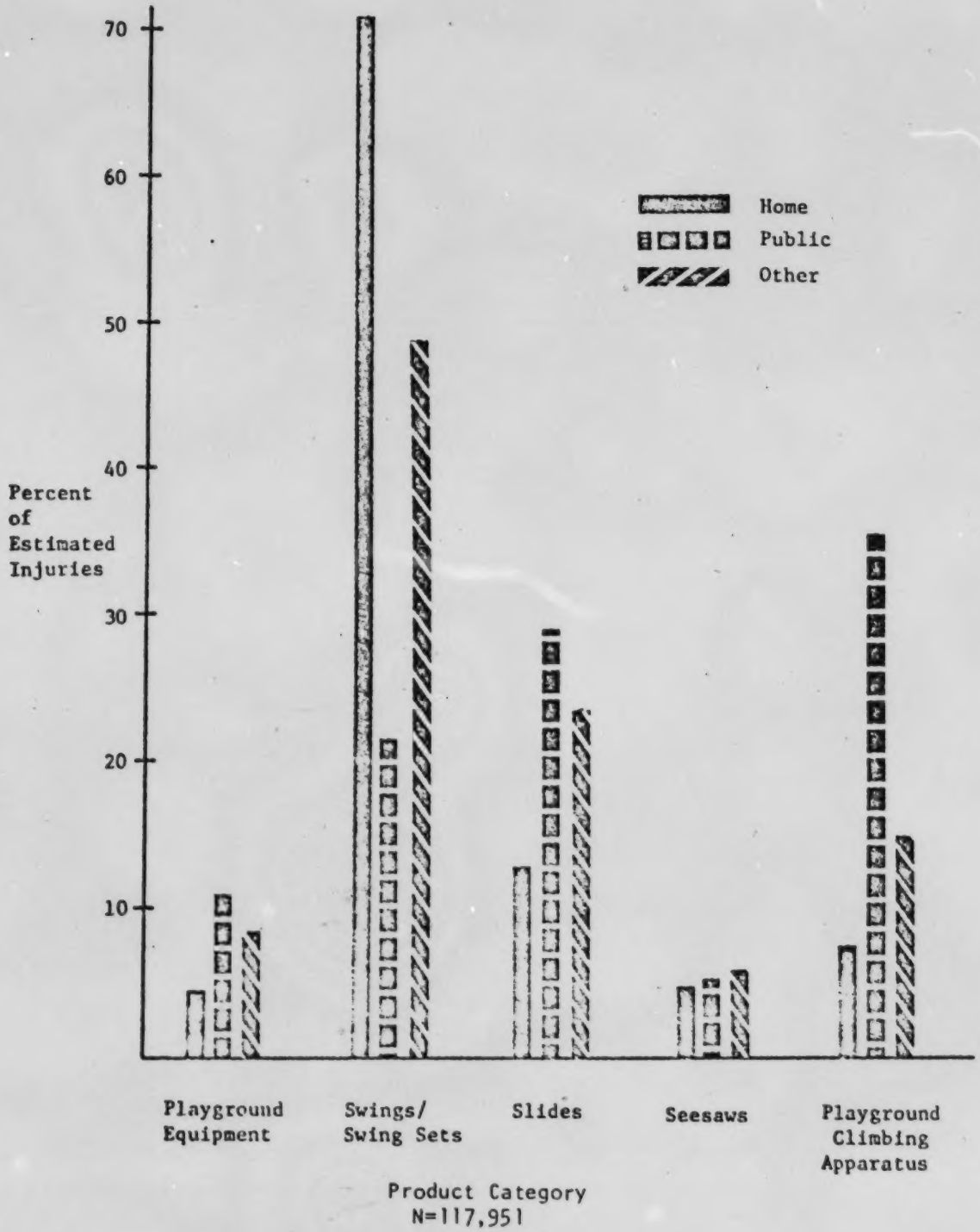
Thirteen of the victims were between the ages of 5 and 9 years. Seven were under 5 years of age. Two were between the ages of 10 and 14 years. Two victims were over 15 years of age; one of these was 63 years old. Fifteen of

Figure 2 United States Consumer Product Safety Commission: Summary of Demographic Characteristics of Estimated Injuries Related to Playground Equipment, 1974.



Source: United States Consumer Product Safety Commission (1975)

Figure 3 United States Consumer Product Safety Commission: Percent of Total Estimated Injuries Treated by Type of Playground Equipment, 1974.



Source: United States Consumer Produce Safety Commission (1975)

the 24 victims were male. Thirteen of the injuries were to the head, nine to the neck, one to the trunk, and one was unknown.

No comprehensive information is given for all 24 deaths, but detailed investigations were done in five of the deaths. Two of the three deaths on home playground equipment resulted from strangulation which occurred when ponchos caught on uprights on slides; the remaining one occurred when an adult male flopped onto a ground slide, breaking his neck. On public playground equipment, two deaths resulted from falls from climbing bars, one victim having extensive head injuries and the other a skull fracture.

The available data, therefore, simply do not give a comprehensive picture of either morbidity or mortality, largely because of the complexity of the problem. Accidents do happen, but it would appear that most are not serious and that the mortality rate is very low.

In summary, the part of the body most frequently injured (approximately one-half) is consistently the head, face or neck area; the most frequent type of injury (approximately one half) is laceration or abrasion; and the most common contributing factor (again, approximately one-half) to the injury is that the child has fallen for one reason or another (McConnell et al. 1973, p. 5).

Types of hazards

Mahajan (1974, p.2) lists three categories of hazards for playground equipment:

1. Hazards directly attributable to any design/construction defects;
2. Hazards which are a result of improper installation and maintenance; and

3. Hazards associated with functional components (i.e., those which are a result of human error, not product defect).

These categories are acceptable, if a broad view of the term "defect" is taken. For example, because children can be expected to fall from various pieces of equipment, it could be said that it is a design defect to place hard surfaces (e.g., asphalt, concrete) under such equipment, thereby increasing the probability of serious injury.

To illustrate the complexity of the problems involved in discussing the causes of playground accidents, it would seem instructive to examine a particular type of accident, for example, falls (National Recreation and Park Association 1976a, pp. 83-84). There are two major types of falls: controlled and uncontrolled. In a controlled fall, the child catches him/herself and breaks the fall to some degree, while in an uncontrolled fall normal acceleration takes place. Falls can be further subdivided into solo and propelled falls. In a solo fall, the child is acting alone and interaction with others is not a factor. In a propelled fall, the child is pushed by another child. Falls are basically a result of two factors: loss of grip and loss of footing. There are two major categories of causes for these factors: physiological and psychological. These categories can be further subdivided:

Physiological:

(a) improper scale of equipment to the child who is using it;

(b) improper material for the design and function of the unit;

(c) changes in the properties of the material, e.g., splintering, slipperiness;

(d) slippery clothing;

(e) pushing by other children;

Psychological:

(a) misperception of the situation, e.g., distance between steps;

(b) misperception of the child's own abilities (which is largely due to inexperience);

(c) fatigue;

(d) emotional stress.

It is highly possible that any given accident is a function of one or more of these causes. No research has been done to deal with the causes of particular accidents on a comprehensive basis. Past research that is of relevance to this study falls into three basic categories: maintenance/manufacturing/construction; types of equipment; and surface materials.

1. Maintenance/Manufacturing/Construction

The National Recreation and Park Association (1976a, pp. 15 and 18) makes two interesting observations:

> There is very little evidence of hazards or injury resulting from equipment failure in public playground apparatus. At least to date, this equipment has been well constructed and is durable.... The incidence of injury relating to maintenance and/or installation...is infrequent.

Two warnings are, however, necessary. First, the statement on construction relates only to public playground apparatus; there is considerable evidence that home playground apparatus is much more dangerous (Mahajan 1974). Second, these statements deal with equipment and not surfacing or with general maintenance. For example, the number of accidents which are a result of falling on broken glass, for example, is very great; obviously, this is a major maintenance issue, but it has little to do with playground equipment or design.

This is not to say that playground equipment is generally in good condition. The only data discovered on condition of equipment is rather unsettling.

After two "ocean wave" roundabouts collapsed, the Greater London Council inspected all of the equipment in their 15 playgrounds for metal corrosion and defective components. The results are to be found in Table 10. All faulty pieces of equipment were immediately put out of action and then repaired or replaced. The Parks Department felt that they may have been overly cautious with some equipment, but is is better to be safe than sorry.

2. Types of Equipment

The actual design of individual pieces of equipment is obviously a factor in accidents and is currently receiving a great deal of attention (e.g., Bongers 1975; Mahajan 1974; McConnell et al. 1973; National Recreation and Park Association 1975a, 1975b, 1976a, 1976b; United States Bureau of Product Safety 1972; United States Consumer Product Safety Commission 1975), particularly in terms of design and performance standards.

Although every effort should be made to reduce the likelihood of hazard as a result of design, the following statements are worth noting:

> ...there does not appear to be a high incidence of injury relating to edges, protrusions and crush points. And when they do occur they tend to be less severe. For this reason, there may be considerably more injuries of this type that occur on the playground that do not get reported...there does not appear to be a high incidence of entrapment-related injury. When it [sic] does occur, entrapment injuries tend to be serious (National Recreation and Park Association 1976a, pp. 15 and 16).

These statements are borne out by several sets of data. For example, data from both the National Recreation and Park Association (1975a) and the Toronto Hospital for Sick Children (Haffey 1974, 1975) indicate that falls and moving impact (i.e., bumps and blows) are the major causes of accidents on all types of equipment. (See Tables 13 and 14.) Obviously, design does create hazards in terms of entrapment, protrusions and the nature of the materials themselves. The issue of design will be dealt with below in terms of performance standards.

Table 12 Greater London Council: Condemned Playground Equipment, 1972.

Type of Equipment	Total Number	Condemned	
		Number	Percentage
Ocean wave	1	1	100.0
Slides	70	49	70.3
Plank swings	76	53	69.7
Flat swings	226	155	68.7
American plane swings	58	21	36.2
Pendulum swings	18	5	27.8

Source: Anonymous, "Getting to grips with the facts", n.d., p. 8

Table 13 National Recreation and Park Association: Comparative Factors in (Private and Public) Playground Equipment Accidents

Type of Equipment	Cause of Accident (Number and Percentage)					
	Total	Falls	Moving Impact	Entrapment	Protrusions	Materials
All Equipment	98 (100.0)	69 (70.4)	18 (18.4)	2 (2.0)	8 (8.2)	1 (1.0)
Climbing Equipment	33 (100.0)	31 (93.9)	0	0	2 (6.1)	0
Swings	30 (100.0)	15 (50.0)	11 (36.7)	1* (3.3)	2 (6.7)	1 (3.3)
Slides	15 (100.0)	11 (73.3)	0	0	4 (26.7)	0
Other Equipment	20 (100.0)	12 (60.0)	7 (35.0)	1 (5.0)	0	0

Source: National Recreation and Park Association, 1975a

*The only death in this study of 98 indepth investigations was on a homemade swing; death was due to cerebral hypoxia and cardiac arrest.

Table 14 Toronto Sick Children's Hospital: Comparative Factors in (Private and Public) Playground Equipment Accidents, 1973 and 1974.

Cause	Type of Equipment or Nature of Accident	Number (and Percentage) of Cases					
		Total		Admitted		Died	
		1973	1974	1973	1974	1973	1974
Falls	All equipment	251 (100.0)	221 (100.0)	34 (100.0)	29 (100.0)	0	0
	- Climbing equipment	62 (24.7)	47 (21.3)	6 (17.6)	*	0	0
	- Swings	68 (27.1)	58 (26.2)	11 (32.4)	*	0	0
	- Slides	104 (41.4)	89 (40.3)	15 (44.1)	*	0	0
	- Seesaws	11 (4.4)	5 (2.3)	0	*	0	0
	- Other equipment	6 (2.4)	0	2 (5.9)	*	0	0
Bumps and blows	All equipment	*	82 (100.0)	*	*	0	0
	- Bumped into playground equipment	*	31 (37.8)	*	*	0	0
	- Hit by swing	*	49 (59.8)	*	*	0	0
	- Hit by glider	*	1 (1.2)	*	*	0	0
	- Hit by seesaw	*	1 (1.2)	*	*	0	0
Other causes	All equipment	1 (100.0)	8 (100.0)	*	*	0	0

Source: Haffey, 1974, 1975

*Not given in detail.

The most serious causes of accidents relate to the use of the equipment, rather than its design per se. The National Park and Recreation Association (1976a, pp. 15 and 16) notes as follows:

> Other than falling from the equipment, injuries resulting from either moving elements striking the user or the user striking another part of the equipment, are the most common cause [sic] of accidents. They also result in some of the most serious types of injury. . . .The most common type of injury results from falling from equipment -- regardless of the reason for the fall. The usual injury agent is the surface under the equipment or another part of the equipment.

There is a great deal of data on the types of equipment on which accidents occur. One issue that must be emphasized, however, is the difference between public and private equipment. For example, McConnell et al. (1973) found that swings account for 50% of the accidents on home equipment with climbing apparatus second (32%), slides third (16%), and seesaws fourth (2%). For public, equipment, the distribution is quite different: climbing apparatus first (43%), then slides (38%), swings (9.5%), and seesaws (9.5%). (See Table 15.) In comparing accidents of home versus public equipment for specific pieces of equipment (see Table 16), it can be seen that home swings account for 83% of all swing accidents; Mahajan's (1974) work on a safety standard and for home swing equipment is desperately needed. Conversely, public slides account for 77% of all slide accidents; perhaps, home slides, which are generally smaller, lower, and fewer in number, are also less attractive than longer and higher public slides. Similar reasons probably account for the fact that 63% of all climbing accidents occurred on public equipment.

There is some evidence to suggest trends in accidents from various types of equipment (National Recreation and Park Association 1976a, p. 13). (See Table 17.) The number if injuries associated with swinging elements has become significantly lower, perhaps as a result of an increase in the number of rubber belt-type seats

Table 15 Institute of Agricultural Medicine, University of Iowa: Playground Equipment Accidents by Specific Types of Equipment.

Equipment	All Cases	Home	Public
Climbing Apparatus	37%	32%	43%
Swings	29%	50%	9.5%
Slides	28%	16%	38%
Seesaws	6%	2%	9.5%
	100%	100%	100%

Source: McConnell et al. 1973, p.11.

Table 16 Institute of Agricultural Medicine, University of Iowa: Playground Equipment Accidents by Location for Specific Types of Equipment

Equipment	Home	Public	Total
Climbing equipment	37%	63%	100%
Swings	83%	17%	100%
Slides	23%	77%	100%
Seesaws	*	*	*

Source: McConnell et al. 1973, p. 12

*Not available

Table 17 National Recreation and Park Association: Injury Trends by Type of (Public) Playground Equipment

	Percentage of Accidents by Type of Equipment		
	1971-72	1973-74	1974-75
Swings	34.2%	29.9%	22.0%
Slides	21.9%	24.6%	25.6%
Seesaws	4.7%	4.4%	5.7%
Climbers	24.9%	32.2%	36.1%
Other	14.3%	8.9%	10.6%
Total	100.0%	100.0%	100.0%

Source: National Recreation and Park Association (1976a)

Table 18 National Recreation and Park Association: Type of Injury by Type of (Public and Private) Playground Equipment (July 1973 - June 1975).

Percentage of Type of Accidents by Type of Equipment (July 1973 - June 1975).

	Laceration	Contusion/ Abrasion	Fracture	Strain/ Sprain	Other	Total
Swings	44.4%	23.1%	19.9%	6.2%	6.4%	100.0%
Slides	32.4%	29.4%	26.8%	8.8%	2.6%	100.0%
Seesaws	42.2%	28.6%	13.4%	5.7%	10.1%	100.0%
Climbers	23.9%	29.1%	29.4%	10.8%	6.8%	100.0%
Other	36.1%	25.2%	17.4%	10.8%	10.5%	100.0%

(Example: 44.4% of all injuries on swings were lacerations)

Source: National Recreation and Park Association (1976a)

on the market or the use of tires as seats. The number associated with climbing apparatus has significantly increased, perhaps as a result of the greater number and variety of such equipment on the market. There have been no significant changes for sliding equipment, seesaws, and other non-specific equipment.

The type of injury also varies with the type of equipment. (See Table 18.) For example, there is a higher incidence of fractures and strains/sprains on climbing equipment and of lacerations on swings and slides.

The major question, however, is whether or not the fault for the accident can be laid on the nature of the equipment itself. The extent to which the operator (i.e., the child) or other children were at fault is a major issue. Obviously, there will be a combination of factors in many cases. A number of sets of data do provide some insight into this problem.

In a study for the Canada Consumer Standards Directorate, Bongers (1975) found that the large majority of accidents for all products, all playground and sports equipment in general, and individual types of playground equipment in particular were not the fault of product failure. Blame could be put on the operator in most cases. (See Table 19.)

With other data, it is possible to subdive further the root cause into people-related (i.e., the direct fault of the operator or another person), product-related (i.e., the direct fault of the product), or people and product-related (i.e., a combination). Examples of these three types would be, respectively, as follows: a child unexpectedly getting off a seesaw, thereby injuring the other child; a piece of equipment breaking, having sharp edges, protrusions, etc.; and a child "horsing around" on a climbing platform and falling over a railing that was too low to stop his fall. As can be seen in Tables 20, 21 and

Table 19 Toronto Sick Children's Hospital: Causative Factors in Playground Equipment Accidents, Summer 1975.

Type of Equipment	No. of Surveys	No. (and %) of Injuries Due to Failure of:*			
		Product	Operator	Unknown	Undetermined
All products	958 (100.0%)	44 (4.6%)	725 (75.7%)	107 (11.2%)	82 (8.6%)
All Playground and Sports Equipment**	206 (100.0%)	10 (4.9%)	149 (72.3%)	30 (14.6%)	17 (8.3%)
Slides	42 (100.0%)	5 (11.9%)	25 (59.5%)	8 (19.0%)	4 (9.5%)
Swings	37 (100.0%)	0 (0.0%)	23 (62.2%)	7 (18.9%)	7 (18.9%)
Climbing Equipment	22 (100.0%)	1 (4.5%)	14 (63.6%)	5 (22.7%)	2 (9.1%)
Other Playground Equipment	21 (100.0%)	0 (0.0%)	16 (76.2%)	3 (14.3%)	2 (9.5%)

Source: Bongers, 1975

* Only those surveys with complete documentation are included.

** Also includes such items as baseballs, footballs, lacrosse balls, volley valls, baseball bats, hockey sticks, lacrosse sticks, golf clubs, tennis racquets, trampolines, swimming pools and diving boards.

Table 20 National Recreation and Park Association: Causative Factors in 98 In-depth Investigations of Playground Equipment Accidents.

Number (and Percentage) of Playground Equipment-Related Accidents

Type of Equipment	Total	Probable Causative Factors			
		People-Related	Product-Related	People and Product-Related	Unknown
All equipment	98 (100.0)	51 (52.0)	4 (4.1)	31 (31.6)	12 (12.2)
Climbing equipment	33 (100.0)	13 (39.4)	0	20 (60.6)	0
Swings	30 (100.0)	19 (63.3)	3 (10.0)	0	8 (26.7)
Slides	15 (100.0)	6 (40.0)	1 (6.7)	4 (26.7)	4 (26.7)
Other equipment	20 (100.0)	13 (65.0)	0	7 (35.0)	0

Source: National Recreation and Park Association (1976a)

Table 21 Vancouver Board of Parks and Recreation: Causative Factors of All "Recorded" Playground Equipment Accidents, 1973, 1974 and 1975*

Number (and Percentage) of Playground Equipment-Related Accidents

Year	Type of Equipment	Total	Probable Causative Factors			
			People-Related	Product-Related**	People and Product-Related	Unknown
1973	All equipment	27 (100.0)	3 (1.1)	1 (3.7)	0	23 (85.2)
	-Climbing equipment	7 (100.0)	1 (14.3)	0	0	6 (84.7)
	-Swings	10 (100.0)	1 (10.0)	0	0	9 (90.0)
	-Slides	1 (100.0)	0	1 (100.0)	0	0
	-Other equipment	9 (100.0)	1 (11.1)	0	1 (11.1)	1 (77.8)
1974	All equipment	17 (100.0)	3 (17.6)	0	0	14 (82.4)
	-Climbing equipment	3 (100.0)	1 (33.3)	0	0	2 (66.7)
	-Swings	2 (100.0)	0	0	0	2 (100.0)
	-Slides	2 (100.0)	0	0	0	2 (100.0)
	-Other equipment	10 (100.0)	2 (20.0)	0	0	8 (80.0)
1975	All equipment	1 (100.0)	1 (100.0)	0	0	0
	-Climbing equipment	0	0	0	0	0
	-Swings	1 (100.0)	1 (100.0)	0	0	0
	-Slides	0	0	0	0	0
	-Other equipment	0	0	0	0	0

Source: L.F. Ryan, Personal communication, 1976

* For children under 16 years of age. No explanation was available as to why the number of accidents has decreased so rapidly.

** Not including playground surface.

22, very few accidents are directly related to the equipment itself. Most are the fault of people directly or a combination of people and product.

3. Surface Materials

McConnell et al. (1973, pp. 9-10) state that in 60% of the public playground equipment accidents they investigated in depth the injury agent was the area beneath the equipment. This was broken down as follows:

Bare ground, gravelled or unspecified	43%
Asphalt or concrete	12%
Sand	2.5%
Safety turf	2.5%

Because no data are available on the incidence of use of the above surface materials, these figures, however, cannot be regarded as a relative rating of safety.

In a study of surface materials, the National Recreation and Park Association (1976b) reached a number of important conclusions. The following materials were rated unacceptable in safe public playgrounds no matter how low the equipment (i.e., minimization of maximum height of fall): concrete, asphalt, and Kempf mat combination (corrigated rubber mat with vinyl cover). Gym mats were acceptable at fall heights of less than four feet and double thick mats showed excellent absorbing capabilities; however, such mats are generally not suitable for outdoor use. Rubber mats showed acceptable impact characteristics up to 4 feet and up to 8 feet if in double thicknesses. Rubber mats reportedly have excellent outdoor characteristics and durability. To date, however, they have not been manufactured in double thicknesses. All sand tested showed extremely low impact levels, results which are in conflict with published literature. Part of this discrepancy may be due to the sand in the laboratory experiment not being as tightly packed as could be expected under real playground conditions. Both

Table 22 United States Product Safety Commission: Causative Factors of 83 In-depth Investigations of Public Playground Equipment Accidents

Number (and Percentage) of Playground Equipment-Related Accidents

Type of Equipment	Total	Probable Causative Factors			
		People-Related	Product-Related*	People & Product-Related	Unknown
All equipment	83 (100.0)	14 (16.9)	7 (8.4)	53 (63.9)	9 (10.8)
Climbing equipment	31 (100.0)	2 (6.4)	0	26 (83.9)	3 (9.7)
Swings	10 (100.0)	6 (60.0)	0	4 (40.0)	0
Slides	25 (100.0)	0	0	21 (84.0)	4 (16.0)
Other equipment	17 (100.0)	6 (35.3)	7 (41.2)	2 (11.8)	2 (11.8)
- Merry-go-round	5 (100.0)	1 (20.0)	4 (20.0)	0	0
- Seesaw	6 (100.0)	4 (66.7)	1 (16.7)	0	1 (16.7)
- Concrete moose	1 (100.0)	0	0	1 (100.0)	
- Rope swing	1 (100.0)	0	1 (100.0)	0	0
-Tire swing	1 (100.0)	0	1 (100.0)	0	0
- Wooden sandbox	1 (100.0)	0	0	0	1 (100.0)
- Toy horse	1 (100.0)	0	0	1 (100.0)	0
- Tubmobile	1 (100.0)	1 (100.0)	0	0	0

Source: United States Product Safety Commission, 1975, pp. 58-59.

* Not including playground surface.

cocoa shell and pine bark show excellent energy-absorbing qualities, but are not conducive to walking or durability. They could be considered for high injury rate locations. Wood chips are good energy absorbers, but get wet, rot and are easily dislodged. Packed earth failed the impact tests. Grass would soon be worn to packed earth by heavy use. Pea gravel is a good energy absorber, provides excellent drainage, is an all-weather surface, and, although it is relatively easy to walk on, it is difficult to run on and impossible to ride a bicycle on. It does, however, require daily raking and can easily be thrown about. Pea gravel and rubber mats are presented as the most viable solutions as energy-absorbing surfaces considering safety, durability and ability to withstand the environment.

IMPACT OF THE ISSUE OF SAFETY

In this section the observed impact of the issue of safety on (a) planning and provision of children's formal play environments, (b) maintenance and (c) programming and supervision will be discussed. A number of recommendations that evolve from this discussion will be offered throughout. No definitive answers or solutions will be developed; the discussion, rather is intended to stimulate further examination of the subject and a questionning of a number of current practices.

(a) Planning and Provision of Children's Formal Play Environments

Included in this section will be a discussion of the following aspects of the process of planning and providing for children's formal play environments: types of formal play environments; location of formal play environments; selection of activity zones/functional areas; layout of activity zones/functional areas; and selection/design of apparatus.

Types of formal play environments

As noted above, there are three basic types of formal play environments: traditional, creative, and adventure. The decision to provide a particular type of play environment would appear to be often based on a belief that one type is safer than the others or is less of a problem in terms of supervision or specialized control (e.g., a play leader). It would appear that in Ontario in particular the general belief of most municipal recreation officials, education officials, and parents is that traditional playgrounds are safer than creative or adventure playgrounds. (There is some evidence to suggest that this belief is more common in smaller municipalities.) Also, there is a tendency to rely on the traditional playground, simply because it is "time-tested" and does not require experimentation with new concepts.

It is usually the case that creative playgrounds are the site of a higher than average number of accidents during the first month that they are "open" after construction. This may be due to two factors: a) the presence of an unfamiliar environment to which children must adapt, and b) the higher number of children that use the playground when it is new and a novelty. The accident rate drops back to or below average after the "break-in period".

The adequate operation of an adventure playground requires a qualified play leader; part of that person's role is to teach the children to use the playground and interact with each other safely. Use of adventure playgrounds is usually prohibited when the play leader is not present. The issue of safety, however, is not normally the primary deterent to the existence of this type of formal play environment.

Location of formal play environments

The location of children's formal play environments is on occasion influenced by the issue of safety. Location takes on two dimensions in this discussion: (a) location of the playground or recreation site which will contain the play area, and (b) location of the playground within the recreation area itself.

Playgrounds are located in both residential and non-residential areas. In recent years, particularly in larger urban centres, increasing numbers of children's playgrounds are being constructed in shopping malls and downtown retail areas. The decision to locate the play area or the recreation site which contains the play area is sometimes influenced by the existence of dangerous or potentially dangerous adjacent environments. These environments include streets with a high volume of vehicular traffic, railway lines, busy parking lots, some industrial developments, etc.

When the issue of safety influences the location decision, busy streets and other dangerous environments are usually avoided as adjacent environments. More often, however, buffering or fencing of the play area or, in the case of a large recreation area, locating the playground away from the incompatable land use is the approach that is employed.

Sometimes adjacent compatable environments affect play area location. In the case of a residential development which includes an apartment building or a cluster of townhouses, the play area is occasionally located to allow parental supervision from the housing unit. It has been recommended, particularly by parents, that more than one play area be located at a high-rise apartment development in order that one play area is visible from all residential units in the building(s).

Sometimes, another recreation activity zone within the park can be dangerous to children's play activities; these activity zones primarily include sports fields. This situation often influences the location of the playground or the decision to fence or buffer the play area to restrict or prohibit access to the sports area(s).

Planners and designers are sometimes influenced so strongly by the desire for a safe playground location that the resultant use of the site is severely restricted. Physical access to dangerous adjacent or nearby environments should be restricted, but visual and physical access to the playground from adjacent areas containing significant numbers of potential users should not be restricted to the point that use is significantly inhibited. If a playground site must be protected from potentially dangerous land uses such that use is seriously restricted, then the playground should be located elsewhere.

Selection of activity zones/functional areas

Good playground planning and design recognizes that there are a number of functions that formal play areas can and should perform. Often, these functions become the theme for the playground and activity zones or functional areas are delineated to represent a playground's purpose. The four most commonly recognized developmental functions are: (a) physical (muscle development, coordination skills, etc.); (b) social (learning to deal with peers and others, etc.); (c) cognitive (developing learning skills, etc.); and (d) emotional (learning self confidence, overcoming fears and inhibitions, etc.). Sometimes, however, these functional parameters are not reflected in separate zones or areas, but dispersed throughout the apparatus of the playground.

Frequently, the issue of safety prohibits or restricts the development of one or more of these functional areas and therefore, restricts the purpose or more specific objectives of all or part of the formal play environment. The most frequently affected types of functional areas are the emotional and cognitive development areas.

Layout of activity zones/functional areas

The two elements of the process of playground layout that should be influenced by need for safety are: (a) the distance between activity zones/nodes/apparatus, and the circulation network; and (b) the intended flow or circulation of users within the playground.

Activity zones or apparatus should be located far enough apart to ensure that activity in one zone will not dangerously interfere with activity in adjacent zones. To determine the extent of this 'field of influence' (i.e., the distance between play elements), several factors must be considered. As apparatus height increases, so should the field of influence due mainly to the

increased propensity for the user to jump or fall farther out from the base of the apparatus and, therefore, closer to the nearest activity area. The type of activities that are possible on any play apparatus influences the extent, direction and intensity of potential interaction beyond the base of the apparatus. Swinging activities may produce a larger field of influence than climbing activities. The construction material of the adjacent activity zone's apparatus can influence the distance that other activity zones must be placed from it. Energy absorbing material will reduce the danger of physical injury and thus the size of the field of influence can be reduced. This can apply to the base material of the circulation network (ground or above ground level) as well; hard surfaces should be located far enough away from the field of influence of other activity zones that accidents are minimized.

Often, the desire to reduce potentially dangerous interaction characteristics in a playground results in apparatus and activity zones being placed too far apart and/or circulation systems at ground or above ground levels not being provided. The distance between activity zones should, therefore, encourage maximum utilization of the playground while providing for adequate safety. Often, a well-designed circulation system can compensate for the distances that are necessary between apparatus. An overhead network can usually be utilized to improve circulation and, therefore, the utility of most playgrounds.

The location or spatial arrangement of one apparatus or activity zone with respect to another piece of apparatus and to the circulation system (if one exists) within the playground should be planned so that dangerous flow patterns of children do not exist. Areas of high congestion and considerable interaction (e.g., between children leaving and approaching two or more pieces of

apparatus such that serious collisions are likely) should be avoided. The arrangement of activity zones and the circulation system, however, should encourage interaction to fulfill the physical and social development functions of a playground and provide a variety of play experiences and of choices to allow the development of learning and decision-making skills and encourage emotional development.

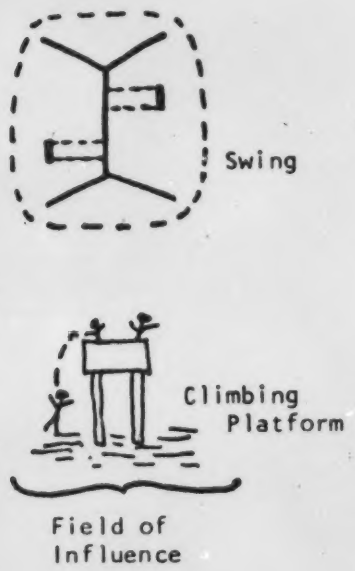
Figure 4 is an illustration of the two issues of field influence and of safety and zonal interaction. Part A is a diagram of the field of influence of various pieces of playground equipment, which is basically the area of potential outward action. Part B is a diagram of an hypothetical play area, showing the necessary separation of activity zones by means of physical barriers and open spaces and the types of zonal interactions possible.

Selection/design of apparatus

A number of important influences can be cited that have influenced the design, selection, construction and installation of apparatus and of activity zones:

1. Some well-established types of equipment have been modified and adapted by agencies providing playground facilities: (a) swings - shifts from metal or wooden seats to tires, belts and ropes - reduction in height of supporting structures - improvements in hardware; (b) slides - decrease in height - improved ladders, platforms and landing pads - increases in width - changes in styles (e.g., up-turned lip at base, tube and trough styles) -

A) FIELD OF INFLUENCE



(Potential Outward Action)

B) SAFETY AND ZONAL INTERACTION

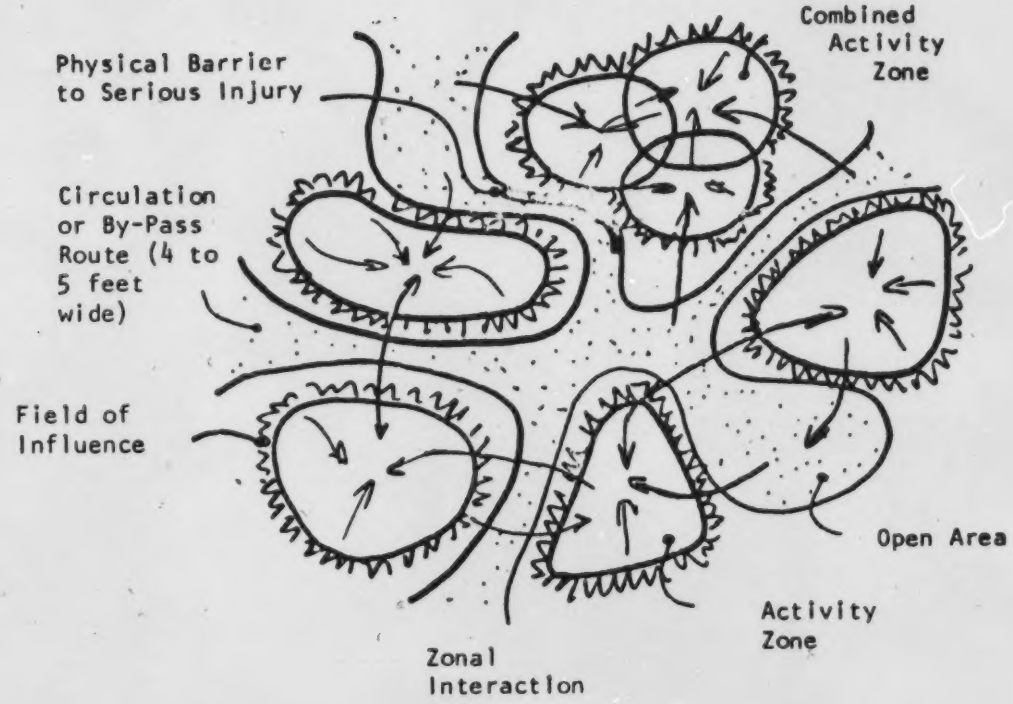


Figure 4 Illustration of Field of Influence and of Safety and Zonal Interaction

Source: Adapted from Osmon (1971)

Figure 4

more use of plastic materials; (c) climbing apparatus - less use of steel - changes in styles.

2. The majority of agencies still, however, continue to select apparatus constructed largely or completed from steel (probably for reasons of durability).

3. The majority of agencies still choose established and time-tested apparatus, rather than innovative apparatus with original designs and new construction techniques and materials.

4. Installation techniques have improved (e.g., more secure bases, increased frost resistance, submerged anchorage).

5. There is a tendency to avoid structures that are high or are on a large scale.

6. Apparatus which have inherent movement/action/flexibility are usually avoided.

7. Overhead linkage or circulation systems are usually avoided.

8. Asphalt as a surface material is being increasingly avoided, as are other hard surface materials.

9. Largely enclosed play structures (e.g., Wendy houses) are usually avoided.

10. Water and the controlled, supervised use of fire as aids to play are avoided.

11. Some agencies are rejecting the use of certain types of apparatus found to be related to accidents (e.g., teeter totters, high slides, slides with humps, round-abouts, wooden or metal seat swings, all-steel climbing equipment, light picnic tables and benches).

12. Most agencies discourage winter use of formal play environments through inappropriate design of the play area and individual apparatus resulting in an unattractive setting for children.

As this report has illustrated, little formal research has been conducted to determine if playgrounds are safe. What information there is available, has not been applied to planning and design in many instances. In Ontario, there are no safety standards relating to the design of children's playgrounds. Because there is little information and no official safety guidelines, the evaluation of plans and designs becomes varied in character and quality. Attitudes and opinions of administrators, planners, designers, parents, etc. are often presented with little basis in factual data. The result is illustrated by the number of different approaches to the provision of formal play environments. Often, innovative and valuable design and planning concepts, and actual site and apparatus plans are 'modified' to the point where their value to children is lost. The same can be said for the acceptance of many new construction materials and techniques. It may be that the issue of safety is the single, most influential factor affecting playground design.

Although a number of supply agencies sampled in this study provided different types of playgrounds ranging through large variations in basic

character, scale, type and height of apparatus, complexity, layout, location and construction material, accident rates varied insignificantly. The data was not sufficiently extensive to provide comprehensive and detailed findings, but there appeared to be no relationship between such factors as height, scale, complexity and basic character and numbers and severity of accidents. More information is provided elsewhere in the report. The major point then is that the independently derived decisions within each supply agency are based to a large degree on a desire for safe environments, but are at best opinions based on personal reactions that do not appear to even account for the records of other play areas that exist in Ontario. A decision to reduce the height of a playground, reject a style or scale of a slide, select base material, reject a design concept, etc., is usually an off-hand and often inconsistent opinion.

(b) Maintenance

Maintenance schedules and procedures are strongly influenced by the desire to ensure that the playground apparatus remains in safe condition. Major maintenance checks are usually provided seasonally, while high-wear, damage-rpone, and easily broken apparatus and hardware are surveyed more frequently by maintenance staff. The owner can be held legally responsible in the case of accidents resulting from broken or deteriorated play apparatus. Hardware, construction techniques, construction and supporting materials, and procedures are on occasion modified to reduce wear and breakage.

Use beyond the summer season is often restricted because most playgrounds and parks in general are not maintained (and designed) to allow and encourage safe, enjoyable winter activities. In the past, vital components of playground apparatus (e.g., swing seats) were removed, while, in some cases the entire apparatus was taken away for the winter months. Even now, use is strongly

discouraged in many instances through blocked access (snow fences, locked gates, snow-covered pathways and entrances) and the inappropriate location of a playground in an area which is highly exposed to winter winds and snow build-up or shaded from winter sum in potential peak use periods. There is little evidence to suggest that playgrounds are more dangerous in the winter. For example, Table 23 indicates relatively constant school yard accident rates throughout the school year (with the exception of the Christmas and March holidays) for the Etobicoke Board of Education. (It is important to note, however, that "school yard" accidents are not defined.) Much could be done to increase winter use through:

- improved maintenance - access
  - ice build-up on apparatus
  - snow removal
  - check for possible different wear characteristics
- improved design to treat ice and snow build-up problems and provide opportunities for winter activities
- improved planning to avoid location and access problems.

There is a point that is often overlooked, however, about maintaining a playground in any season. A children's playground can be over-maintained in the sense that it can be kept too tidy and manicured, often producing a sterile and uninviting environment that does not attract many child users. Rather, the playground appears acceptable by most adult standards, but may be rejected by children much of the time.

(c) Programming and Supervision

The issue of safety often influences the use that is made of children's play areas through the control that is exercised over the child by education and recreation programmes (e.g., school and park summer playground programmes)

Table 23 Etobicoke Board of Education: Public School Yard Accidents, 1974-1975

Month	School Yard Accidents	
	Number	Percentage
September (1974)	47	10.5
October	54	12.1
November	46	10.3
December	20	4.5
January (1975)	56	12.5
February	52	11.6
March	23	5.1
April	45	10.1
May	57	12.8
June	47	10.5
Total	447	100.0

Source: Etobicoke Board of Education, personal communication, 1976.

and supervision of playground areas. Often, formal play environments located at school sites, in parks and housing developments are not integrated into a playground programme offered by a public or private agency. The inherent values that some playgrounds contain are never fully realized by either the programme leader or the children. The fear of being held responsible for an accident on the playground influences programme leaders and administrators to highly restrict use in a number of ways: (a) prohibiting the use of the formal play area in the programme; (b) limiting the number of users on the formal play area (overcrowding is undesirable, but some playgrounds thrive on large numbers of users); and (c) restricting the type of activities and thus the utility potential of the playground.

The formal play environment should be integrated into children's programmes if the play area has been planned, designed and constructed to provide valuable play potential. Through awareness programmes, more recreation and education administrators and recreation and education program professionals can be informed of the potential of good formal play environments as one part of the total play resource that children need in contemporary urban centres.

PERFORMANCE STANDARDS

As noted above, performance standards are preferable to design standards because the focus is on hazards rather than on specific pieces of equipment. Once a safety requirement is established based on performance it can apply to any given piece of equipment.

It is suggested that performance standards should be developed for playground equipment. Few accidents are directly attributable to design error or product failure, but most of these accidents could be avoided if all equipment had to meet performance standards.

The most extensive work in this area is being conducted by the National Recreation and Park Association (1975a, 1975b, 1976a, 1976b) for the United States Consumer Product Safety Commission. Below is a summary of their draft results.

TESTING FACTORS

A number of factors can be cited as being important testing criteria for safety considerations.

Surface material

As noted above, a large proportion of playground accidents are caused by falls on hard surfaces. As a result, surface material should be examined as an integral and indispensable aspect of safety.

Impact

Two types of impact are of concern: being struck by a moving object and running into or falling onto a fixed object.

Abrasion

Beyond qualitative judgements, abrasion is a very difficult factor to measure.

Durability

There are a number of components in any decision on durability: cost, maintenance, replacement, aesthetics, etc.

Friction

Although difficult to measure because of wide ranges of surfaces, apparel, and atmospheric conditions, friction is a major safety factor.

Costs

Economic impact is an important factor in the development of standards.

Supervision

This is probably the single most important factor in safety, but is extremely dependent on the availability of trained personnel and funds.

Age grouping

Equipment must be designed to be used by specific ages of children, but it must not create hazards for children of other ages. The intent should also be to minimize the danger for smaller/younger children, who are less capable of protecting themselves. There is, however, the danger that this might eliminate the play value for taller/older children.

Labelling

Proper labelling of equipment can serve a number of functions, including the provision of special instructions or warnings.

Use area

Care must be taken to clearly define the area which must be dedicated to a specific piece of equipment or specific system in order to avoid conflicting or over-lapping activities which might create hazards.

Safety Requirements

Materials of Manufacture and Construction

Materials - All materials shall be selected for their durability and resistance to deterioration as determined by existing tests recognized for this purpose.

Structural Integrity - All equipment shall be constructed to withstand respective static, or dynamic load testing, and/or, a calculated analysis based on the following requirements:

1. All continuous closed surfaces such as platforms, ramps, slide bedways, etc. of less than 2 square feet in surface area shall withstand a static load of at least 300 pounds.
2. All continuous closed surfaces such as platforms, ramps, slide bedways, etc. of 2 square feet or greater in surface area shall withstand 150 pounds per square foot.
3. All horizontal members shall withstand a vertical static load of 300 pounds per running foot when tested individually, or 200 pounds per running foot when tested in combined loading.
4. All members subject to lateral forces shall withstand a horizontal force of 100 pounds per running foot.
5. All suspension supports and suspension members shall withstand 300 pounds per each anticipated unit of usage for multiple occupancy units. Single occupancy units shall withstand 600 pounds loading.

Stability - The equipment shall withstand maximum anticipated forces tending to tip the equipment when properly installed as determined by computation and/or testing.

Hardware - Lockwashers, self-locking nuts, or other locking means shall be provided for all bolts. All connecting devices shall be such that the members cannot be disconnected with a 15 pound force. Suspension hooks shall be closed and shall not open with the application of 300 pounds per user. An open hook is defined as one which will allow a 1/16 inch shim to penetrate its interior.

Finishes - All surfaces when or where applicable shall be plated, galvanized, painted, or otherwise protected to resist corrosion and deterioration. No preservative or other coating shall be used on play surfaces of equipment which shall be irritating to or toxic through human skin.

Edges, protrusions and crush points

Edges - Following assembly and installation in accordance with the manufacturer's instructions, there shall be no sharp edges or surfaces that cut, puncture or lacerate human tissue on casual contact or intended use. All accessible edges shall be protected by hemming, easing, rolling, curling, or by capping with a plastic sleeve, or by other means. The exposed open ends of all tubing not resting on the ground or otherwise covered shall be shielded by smoothly finished plugs, covers, or protective caps. Applied shields shall not be removable without the use of tools.

Pinch and Crush Points - There shall be no accessible components moving relative to one another which may cause injury. Chains used to support swinging elements are excluded from this requirement.

Protruding Bolts - Exposed ends of accessible threaded bolts shall not exceed one-half of the diameter of the bolt. All bolts less

than 1 1/2 inches in diameter shall not extend more than one-quarter inch maximum.

Other Protrusions - Any other projecting member of component with an end diameter or smallest end dimension less than 1 1/2 inches shall not extend more than one-half of the diameter or minimum dimension beyond the surrounding surface. A series of two or more projections having a space between them of less than one-half of the diameter or minimum dimension shall be excluded from this requirement if their combined diameter or minimum dimension is greater than 1 1/2 inches. U-shaped hand holds and/or foot holds are excluded from this requirement.

Moving impact

Suspended Elements - All suspended elements shall meet the following requirements:

1. No suspended elements may impart an impact in excess of 50G peak. If the impact is greater than 25G peak but less than 50G peak, the point of impact of the element must measure at least one inch in its minimum dimension and have a minimum radius of curvature of 1/4 inch. If the impact is less than 25G peak, there are no further requirements except as defined under other sections of these standards.
2. All suspended elements shall have a minimum clearance of 18 inches between the outside edge of the element and another element or supporting member, as measured horizontally at any seat level.
3. All suspended elements designed for grasping and swinging exclusively by the hands, i.e., trapeze bars and rings, shall be placed above the height of the maximum user.

Rotating Equipment - All rotating equipment shall meet the following requirements:

1. The peripheral velocity shall not exceed 15 feet per second.
2. The shape of the base shall not have a configuration (in the horizontal plane) that represents a potential for impact injury. Equipment not exceeding a maximum peripheral velocity of 5 feet per second is excluded from this requirement.
3. The structure of the base shall be continuous with no openings accessible to any part of the body. The rotating mechanisms (bearings, shaft, etc.) shall be inaccessible.
4. All hand holds or rails shall be recessed 6-10 inches from the outside edge of the base.

Slide Incline and Exit - The exit end of any slide bed shall be designed to be at least 12 inches and no greater than 16 inches from ground level and shall have a reduced gradient exit surface which is at least 15 inches in length. The end of the exit surface shall be designed to be parallel (plus or minus 4 degrees) to the ground. The slide bed shall be at least twice as long as it is high. Slides whose maximum height is less than 4 feet are exempt from this requirement.

Entrapment

Openings - The equipment or its components shall contain no openings either enclosed or formed by adjacent elements that can trap a user's head. Openings within 18 inches of the ground or other surface which provides the same opportunity for supporting the body and limbs under all conditions and in all directions are exempt from this requirement.

Angles - Any angle, or group of angles, comprised of any two or more members forming, or approximating a "V", whose interior angle is less than 55 degrees, shall have this angle eliminated by covering or other means. "V's" which are inverted, or with the apex 18 inches or less above ground level or other surfaces which provide the same opportunity for supporting the body and limbs are exempt from this requirement. Angles having one side less than 3 inches in length are exempt from this requirement.

Falls from Equipment

High Equipment - Any portion of any equipment intended for use 8 feet or more above the ground or other surface completely surrounding the accessible portion in question, which provides the same opportunity to terminate the fall, must be totally enclosed to eliminate the risk of falling.

Intermediate Level Equipment - Any accessible portion of any equipment intended for use between 4 feet and 8 feet above the ground or other surface completely surrounding the accessible portion in question, which provides the same opportunity to terminate the fall, must have a guard railing which is within reach of the minimum and maximum intended user.

Clearance - Equipment for which the intended use includes hanging by the hands (such as horizontal ladders, arch climbers, and cable slings) shall not be higher than 6 inches above the maximum upward reach of the intended user at its highest point.

Hand Gripping Surfaces - All hand gripping surfaces of equipment whose intended uses includes hanging by the hands (such as horizontal ladders, arch climbers, and cable slings) shall be at least 3/4

inch and not more than 1 inch in diameter, or minimum and maximum dimension.

Slide Sides - Any slide having a maximum height of at least 4 feet shall have slide sides that project at least 3 inches above the center of the sliding surface when measured perpendicularly to that surface. Slides whose maximum height is less than 4 feet are exempt from this requirement.

Ladder Incline - All ladders whose steps are intended for use only by the foot shall have a minimum incline of 15 degrees forward from the vertical.

Ladder Steps - The steps of ladders intended for use only by the foot shall be at least 12 inches in length, 6 inches in depth, evenly spaced (between 9 and 11 inches apart) when measured vertically and have a contact surface which provides resistance to slipping. Such ladders shall be provided with hand rails above 4 feet on both sides while ascending or descending steps and guard rails on both sides to provide security in the transition from the ladder to the next surface.

Friction - All elements intended for walking and/or climbing or grasping by the hands shall have a contact surface which provides resistance to slipping.

Surfaces Under Equipment

The manufacturer shall provide, as a part of all promotional brochures, installation instructions and any other appropriate educational or informational literature, test data and accompanying statements on surfacing material.

Maintenance, Installation, and Identification

Maintenance - Manufacturers shall furnish complete instructions for the general maintenance of their specific assembled equipment.

Installation - Manufacturers shall include with each piece of equipment a set of written instructions, that include the following:

1. Instructions for assembly which shall include a drawing and/or model showing complete views as necessary for clear reference to identify all component parts. The instructions shall be written in such a manner that they may be readily understood by the installer.
2. A complete list of all component parts and identification name and part number.
3. The following statements:
   a. All equipment shall be installed in accordance with the enclosed instructions.
   b. Concrete footer sizes are suggestions only. Local soil conditions may necessitate significant changes.
   c. The upper surface of all concrete footers should be at least 4 inches below the subsurface. Surfacing materials which are easily dislodged shall not be considered as part of the depth. Surfacing materials which are permanent and energy-absorbing materials which adequately cover the footer material may allow the footer to be located immediately beneath it.
   d. Protective surfacing materials should extend at least to the edge of the use area. For fixed equipment the use area is

15 feet in all directions. For equipment imparting momentum to the user (slides, whirls, etc.) the recommended use area is 20 feet.

e. No piece of equipment or composite unit should encroach on the use area of another piece of equipment.

f. Equipment having therapeutic swing seats may represent additional safety hazards because of their rigidity and weight. Such swings should be placed in protected areas, removed from normal traffic patterns on the playground.

g. All circular moving equipment with a base intended for standing or sitting should be installed within 1/2 inch of a permanently solid surface. The solid surface should not extend more than 1 inch beyond the base.

h. Make certain that all hooks are clinched, all bolts are tightened, peened, or locked, and all bolt caps and tubing end closures are effected as required by safety standards and the practice of the trade.

i. All sliding equipment should be oriented in a northerly direction to keep the sliding surface away from direct contact with the summer sun.

Identification - All equipment shall have permanent labels which identify the manufacturer, and the intended user if designed for a specific age group.

THE ISSUE OF LIABILITY

Liability and negligence[1]

Because negligence is based in the Common Law, it is dependent on past cases to set out specific legal duties. The lack of cases dealing with recreation situations in general and playgrounds in particular has made it difficult for both recreation administrators and recreation participants to become aware of their legal duties (Lutzin and Storey 1973, p.68). An attempt is made in this section, however, to relate important legal precedents in various recreation settings to playground situations.

In the case of an agency providing recreation services, liability for negligence may exist at varying degrees of remoteness from the injury, including:

1) the employee whose conduct is the direct or proximate cause of the particular injury in question;
2) the independent contractor (if resulting from his actions);
3) the recreation supervisor or park manager;
4) the recreation board members or other high level personnel; and
5) the unit of government or the agency itself as the sponsor of recreation activities (Ibid., p. 88).

Negligence can be the result of intentional or unintentional conduct (Ibid., p.90). While the same wrongful act may constitute both a crime and a tort (negligence), the crime is an offence against the public (Fleming 1965, p.3). Torts create private injury and the cause of action lies with the individual subject to harm. Tortious conduct can be either an act or an omission (Lutzin and Storey 1973, p.90).

1. The authors are indebted to Youngblut (1975) for his excellent work on this subject.

The purpose of the law of tort (i.e., the law of liability) is to compensate one who has lost through injury caused by the negligence of another, rather than emphasizing penalty and punishment. The most commonly accepted definition of negligence was stated by Lord Atkin in 1856:

> Negligence is the omission to do something which a reasonable man, guided upon those considerations that ordinarily regulate the conduct of human affairs, would do, or something which a prudent or reasonable man would not do.[2]

As Youngblut (1975, pp.24-25) notes, although there are a number of legal concepts which may affect to varying degrees a decision of negligence, the modern law of tort has set out three criteria for determining the existence of negligence. These criteria - duty, breach of duty, and damages - must all exist in order to prove negligence.

In other words, the following criteria must be met:

1) that the defendant had a legal duty to perform;
2) that there was a breach of duty on the part of the defendant; and
3) that the breach of duty directly caused injury or harm which otherwise would not have occurred (Youngblut 1975, p.3).

There are various types and classifications of liability (Chapman 1965, p.35).

The invitee is a person whom the property owner asks onto the property. The invitee should be protected from danger about which the owner knows or at least about which the prudent owner should know. In a recreation setting, this situation is common. The property owner who charges admission (e.g., arenas, swimming pools) owes the greatest amount of protection from known

2. Heuston 1961, p.406; citing Blyth v. Birmingham Waterworks Company (1856) 11 Ex. 781 at 784.

danger.

A person on property with express or implied permission, such as a social guest or a door to door salesman, is entitled by law to a warning of danger when entering onto an owner's property as a licensee. The trespasser has no rights to such a notice; however, he is not fair game for the owner to injure. Children are not considered as trespassers if they are attracted by what are termed attractive nuisances. Open swimming pools and construction areas are considered to be attractive nuisances.

The agony of the moment classification of liability occurs when a person is forced by another to make a quick decision which turns out to be wrong and consequently causes injury. For example, if a person is given reason to believe that a car is going to hit him as he is walking on the sidewalk, and he dives into a ditch to avoid the accident and consequently breaks his leg, the car driver is nevertheless liable even if the car stays on the roadway.

Contributory negligence exists when the injured party is partly to blame for the accident. Consequently, the person may receive part but not the entire amount of compensation. The phrase volenti non fit inuria means exposing oneself to danger. This act does not allow a person to be compensated for damages he received. For example, a spectator at a hockey game after being hit by a puck cannot sue for compensation.

Vicarious liability can exist when an employer is held liable for an employee driving a company vehicle. A person may also be liable for using his land or conducting himself in a manner which is harmful to others. Conceivably, these points could apply to recreation settings.

There is a great lack of clarity, however, in cases dealing with recreation activities. A number of studies have attempted to clarify the issue. For example, Sinclair (1971) found that school administrators in the United States, at least, incur personal liability for their negligence when they are found to have the duty of providing a safe school environment. On the other hand, van der Smissen (1968, p.195) found that, basically, "general supervision" was considered adequate by the courts when supervising a playground. Many cases, however, indicated that a supervisor's duty included stopping any rowdy activities which were considered dangerous. Extra supervision may also be required when the supervisor has knowledge of a special condition of a participant, such as a physical handicap. Generally, she (1968, p.256) found that the trend is toward the effect of government immunity being tempered by permission to carry insurance and allowing the injured party to recover up to the amount of the insurance coverage.

At least in the United States, Freeberg (1949) states that the laws of liability differ considerably according to the kind of sponsoring agency. In the majority of states, a charitable corporation is immune from tort liability to recipients of the charity providing the corporation has used reasonable care in the selection of its officers, agents or employees. Liability of municipal corporations is determined by whether the services rendered are considered a governmental or proprietary function. Generally speaking, when services are a government function, the municipal corporation is immune to liability. This is not the case if the services are a proprietary function.

In Germany, liability in recreation settings is also under discussion. Agde and Ertel (1973, p.58) have written on the topic of liability in the playground environment:

> The hazard which exists, be it to achieve a result in a game or aiming at it, thereby overestimating their strength or ability, can lead to accidents...For these the playground owner can not be called-on for damage compensation.

Further, they present some guidelines upon which liability may be judged in Germany:

> The injured has full responsibility for hazards which are caused by the game, even if despite regard to the rule of the game and the correct state of the apparatus, an accident occurs (p.58).
>
> The manufacturer has the duty to point out to the buyer of the games facility, if and what kind of special hazard to certain age groups exist, if inappropriately used. He himself is liable for the compensation of damages, if he failed to advise the erector (p.59).
>
> For an apparatus of 3 feet to 4 feet in height (in this instance a slide on concrete foundation) additional safeguards against falling off (railings) must be fixed as we can expect considerable injury when the child falls off without safeguards (p.60).
>
> The apparatus are...to be inspected for safety in regular intervals (p.61).

Several other duties and points of law are indicated in the article and the theme of becoming aware of carelessness is clearly presented.

School playgrounds

The duty owed by a school board to elementary school pupils in a playground has been established and refined several times in Canadian courts of law.

> The common law imposes a duty on a schoolmaster to take such care of his pupils as a careful father would take of his children. Neither a school principal nor the School Board is an insurer of pupils while they are playing on school premises during school hours, as, for example, at recess. But in testing liability it is pertinent to inquire whether what happened was reasonably foreseeable so that it should have been guarded against.[3]

3. Brost and Brost v. Board of Trustees of Eastern Irrigation School Division No. 44 et al, (1955) 3 D.L.R. 159.

This duty is reiterated in a later case and is stated as follows:

> It is not the duty of teachers to keep pupils under supervision every moment of their time at school but merely to take such care as a careful parent would take in the circumstances and guard against dangers that could reasonably be foreseeable.[4]

The legal concept in common law of action in place of a parent is termed in loco parentis. It provides a standard by which the courts may compare the actions of a supervisor of children. Another concern in setting a standard to measure reasonable action is the classification of the child under the concept of occupier's liability. A fourth classification in addition to invitee, licensee, and trespasser is discussed by the courts. The category to which the highest duty is owed is to persons entering the premises under a contract. It was thought to include the elementary school pupil in this category which is higher than that to an invitee,[5] but this classification was later changed:

> The standard of care to be exercised by an elementary school board towards its pupils with respect to the condition of its premises is the duty owing by an invitor to an invitee (and not, semble, the higher duty of care owed by an occupier to persons entering premises under a contract), that is, the exercise of reasonable care to prevent damage from unusual dangers of which it knows or ought to know.[6]

This duty owed to an invitee of being safeguarded from unusual dangers is known as the principle of Indemaur v. Dames.[7] This change in the classification of an elementary school pupil lessens the restrictiveness of the law and appears to reflect a realization of the difficult task of teachers in supervising children in playgrounds. For example, years ago the duty of a teacher in the supervision of boys was stated as follows:

4. Portelance v. Board of Trustees of Roman Catholic Separate School for School Section No. 5 in Township of Grantham (1962) 32 D.L.R. (2d) 337 at 338.
5. Brost and Brost v. Board of Trustees of Eastern Irrigation School Division No. 44 et al., supra.
6. Portelance v. Board of Trustees of Roman Catholic Separate School for School Section No. 5 in Township of Grantham, supra, p.337.
7. Indemaur v. Dames 1866 L.R. 1 C.P. 274, at 288, 35 L.J.C.P. 184.

> The schoolmaster was bound to take care of his boys as a careful father...he was bound to take notice of the ordinary nature of young boys, their tendency to do mischievous acts and their propensity to meddle with anything that can in their way.[8]

This statement has been somewhat tempered:

> The courts' realization of the necessity of developing a sense of responsibility in children has led to a changing attitude and a more practical approach to the question of supervision by school authorities. While there is a duty to supervise certain activities, such duty bears some relation to the age of pupils, the special circumstances of each case and, particularly, the type of activity.[9]

Under these guidelines the courts have reached several decisions specifically regarding the duties of teachers in supervising playgrounds. General supervision is considered adequate in supervising children. In one case, this was taken to mean that four teachers (two in the boys' section and two in the girls' section) could adequately supervise five hundred pupils.[10] It follows that, using general supervision, the teacher cannot be expected to see every single activity and its potential dangerous consequences. Therefore, boys injured when running through hawthorn trees or being hit in the eye with acorns or wires or such objects are not events that a teacher could be expected to prevent or foresee.[11] Similarly, if a child is warned of a potential danger and can appreciate the significance of that danger, the courts are hesitant to place responsibility for injury on the supervisor.[12] However, it is a duty

8. Williams v. Eady, 1894 10 T.L.R. 41 at 42.
9. Schade and Schade v. Winnipeg School District No. 1 and Ducharme, (1959) 28 W.W.R. 577.
10. Dyer (otherwise Venables) et al. v. Board of School Commissioners of Halifax, 2 D.S.R. (2d) 394.
11. Dyer v. Board of School Commissioners of Halifax; Durham et al. v. Public School Board of Township School Area of North Oxford, (1960) 23 D.L.R. (2d) 711; Portelance v. Board of Trustees of Roman Catholic Separate School for School Section No. 5 in Township of Grantham. See also Boryskp v. Board of Education of City of Toronto and Benett-Pratt Ltd., (1963) 35 D.L.R. (2d) 529.
12. Schade and Schade v. Winnipeg School District No.1 and Ducharme.

of a school playground supervisor to provide "assiduous attention to the health and comfort of pupils".[13] Thus, when a pupil is hurt during play it is a responsibility of the teacher to ensure that further play will not aggravate the injury before the child receives proper medical attention.[14] Also, failure to supervise obvious dangers such as ongoing construction work at the school, and failure to provide supervision during recess when supervision could prevent an accident are both instances of negligence if injury occurs.[15] When degree of supervision is the question before the courts, however, the law does not wish to become too restrictive and it strongly considers whether supervision could have prevented the injury.

> The mere possibility of injury resulting from a game is not sufficient to establish breach of duty, especially when it is not shown that supervision could have prevented injury to a child from another player's breach of the rules.[16]

Municipal playgrounds

As evidenced with cases of negligence in school playgrounds, it is a duty of municipal playground administrators to provide a safe environment free from unusual dangers. It is not a requirement that every municipal playground have a supervisor, but there is an established duty to maintain equipment in a safe condition. Of particular note is the situation whereby nature creates an attraction for children's play on city land. For example, when a hill turns icy and makes an attractive winter slide the city is not responsible for a child injuriously slipping on it when playing.

13. Toronto Board of Education v. Higgs, (1960) S.C.R. 174, 22 D.L.R.(2d) 49.
14. Ibid.
15. Brost and Brost v. Board of Trustees of Eastern Irrigation School Division No. 44 et al.
16. Gard v. Board of School Trustees of Duncan (1946) 2 D.L.R. 441.

> The burden of proof as to a defect in the slide is on the plaintiff...Nor was there a duty to supervise the playground to any greater extent that it did; neither could I find that any supervision could have prevented the accident.[17]

When holes on vacant land or construction sites fill up with water they are classified as an allurement to children who cannot appreciate the danger. This level of understanding has received some attention in the courts. At first, the age level was not very firmly established:

> Mere age is not itself the test but rather the capacity of the infant to understand and appreciate.[18]

However, a few years later the courts added more substance to this topic:

> Liability for an allurement only attaches to a defendent in a negligence action when the plaintiff child is too young to understand the danger of yielding to an allurement. On the authorities, the maximum age appears to be seven years.[19]

So, when two teen-age girls drown as a result of swimming in a water-filled construction hole, specifically after they had been warned not to be there, there is no negligence.[20]

In situations where municipal playgrounds are supervised there have been very few reported cases of negligence. It can only be said that the municipality has the obligation to make some reasonable effort to protect children using the playground from dangers that are known or can reasonably be apprehended.[21]

17. Desoutels v. Regina (City), (1974) 3 D.L.R. 804.
18. Sheasgreen et al. v. Morgan et al., (1952) 1 D.L.R. 48.
19. McEwen v. Canadian National Railways and Imperial Oil Limited, (1962) 38 W.W.R. 76.
20. Nelson v. Town of The Pas, (1969) 67 W.W.R. 580.
21. McStravick v. Ottawa, (1929) O.L.R. 626, affirmed 64 O.L.R. 275.

Facility Operators

State of the Premises

A recreation facility owner or operator must take such precautions as to reasonably provide a safe environment for the users of the facility. Generally, two aspects of negligence become focal in establishing the legal duty of the facility operator. First, the level of duty owed to the user must be established under the terms of occupier's liability. Second, potential dangers must be established as reasonably foreseeable.

> The duty of the occupier of premises to which the public have a right to resort is that reasonable care must be taken to see that the premises are reasonably safe for persons using them in the ordinary and customary manner, and with reasonable care.[22]

Therefore, it is the duty of a facility owner in winter not to allow ice to form on steps leading to his premises.[23] Also, it is the duty of the recreation facility operator to take reasonable care in providing a safe floor upon which to walk inside the facility.

The facility owner is not expected to be able to guarantee complete safety in the recreation environment of his facility. It is the intent of the law to place enough legal responsibility at the hands of the facility owner that he may not show a careless disregard for the state of his premises. It appears that a major factor in the issue of slipping on floors is the presence of a regular system of ensuring that the floors are not a source of danger.

The facility owner must develop an awareness of possible dangers as a result of the actions of the users.

The facility owner must take precautions to provide users with a safe entrance and exit from the facility. It should be remembered that not only steps

22. McPhee v. Toronto and Bulmer (1915) 9 O.W.N. 150 (C.A.).
23. Nickell v. Windsor (1927) 59 O.L.R. 618; 1 D.L.R. 379 (C.A.).

should be clear of dangers of ice, snow or debris but also sidewalks and parking lots.

Generally, the facility owner has the legal duty to keep his building or field consistently free of potential dangers. He is responsible for the loose railing which gives way when someone leans on it.[24] He is responsible for the hole which he covers with a piece of wood too thin to hold a person's weight.[25] And he is responsible for allowing debris to remain on a playing field where it constitutes a danger to the play of children.[26]

It has been argued that the architect should be responsible for the failure of facility property. The courts have ruled in a case concerning an arena that the arena management is responsible for making the arena a safe place.[27] It appears that the architect is responsible for only the most major aspects about which arena management could not be expected to know.[28] However, a close examination of the agreement between an architect and the facility owner will aid in the determination of legal responsibility for the failure of various aspects of a building to provide adequate safety. Similarly, an agreement between a facility owner and an outside group using the facility is a major aid in the determination of legal responsibilities. For example, a theatrical group was using a company theatre when a boy in the theatrical group was killed as a result of a shock from a lamp. The existing agreement between the company and the theatrical group clearly stated that the lighting and electrical equipment used by the group was the sole responsibility of the theatrical group.

24. Stewart V. Cobalt Curling and Skating Association (1909) 19 O.L.R. 667, 1 O.W.N. 203, 14 O.W.R. 1063 (D.C.), 14 O.W.R. 171.
25. MacKinder and MacKinder v. City of London (1953) O.R. 52, (1953) O.W.N. 18, (1953) 1 D.L.R. 452, (C.A.)
26. Pook v. Ernesttown School Trustees (1944) O.R. 465, (1944) O.W.N. 543, (1944) 4 D.L.R. 268.
27. Stewart v. Cobalt Curling and Skating Association, supra.
28. Hill v. Taylor (1905) 9 O.L.R. 643, 5 O.W.R. 85 (D.C.), 4 O.W.R. 284.

The company was not liable.[29] As well, it appears that not every component of a facility is guaranteed to be perfectly safe. For instance, a bursting spotlight over a theatre stage which injured a performer did not result in the owner being found negligent. The court ruled that a bursting spotlight was not a foreseeable event.[30]

Although the long and safe use of a facility is not a guarantee that the condition of the facility is safe, it may be a factor in the determination of liability. Such was the case when a nineteen year-old diver hit his head on submerged safety steps in a pool. Two central factors in the case were the plaintiff's ability and past record of use of the pool and the fact that about one-quarter of a million persons had previously used the pool without injury.[31] It was determined that the plaintiff was the author of his own misfortune.[32]

Standard of care owed to facility users

The term "standard of care" in the common law refers to the degree of skill or knowledge expected from an individual considering the individual's background and abilities. Thus a doctor has a higher standard of care in medical matters than a non-medically qualified person. Similarly, an arena manager is expected to know more about arena management than a school teacher or carpenter. What might be careless action for an arena manager in an arena may not be considered careless action by a person who has no experience with arena management. Therefore, each facility owner has a certain standard of

29. Bradd v. Witney (1907) 14 O.L.R. 415, 9 O.W.R. 656, (D.C.)

30. Hambourg v. T. Eaton Company Ltd. (1935) S.C.R. 430, (1953) 3 D.L.R. 305 (S.C.C.); 1934 O.W.N. 115, (C.A.)

31. Kester v. Hamilton (1937) O.R. 420, (1937) 2 D.L.R. 330, reversing (1936) O.R. 461, (1936) 4 D.L.R. 76, (C.A.).

32. Ibid.

care owed to the facility users in respect to safeguarding the users from foreseeable dangers. In cases of negligence, it is left to the courts to determine this standard.

Even the most highly trained facility owners and operators cannot prevent all possible injuries. This fact is recognized by the courts as they attempt to arrive at a decision. The concept of what the reasonable man would or would not do plays a major part in determining the standard of care.

> The obligation under which one rests toward another to whom he stands in the fullest relation of duty is only to keep him reasonably safe, not perfectly safe.[33]

Therefore, in considering the height and existence of a railing around a track in a Y.M.C.A., the court ruled that a boy falling from a running track which was elevated eleven feet from the main gym flood did not constitute negligence on the part of the facility owners.[34]

A facility operator is not expected to supervise every move of a user, but is expected to take such action as to warn the user of potential hidden dangers under conditions where the user is classified as a licensee under the terms of occupier's liability.

> An occupier is liable to a licensee in respect of a concealed trap or danger notwithstanding the negligence of the licensee, who, if he had exercised great care, could have detected the danger in time to avoid it, but whose lack of care was induced, in part at least, by the continuing sense of false security created by the trap.[35]

33. McLean v. Y.M.C.A. (1918) 3 W.W.R. 522, 14 A.L.R. 58, (C.A.).

34. Ibid.

35. Bisson v. District of Powell River (1968) 66 D.L.R. (2d) 226.

Therefore, it is the facility operator's duty to prevent injury occurring as a result of a concealed danger, but, just as important, it is recognized that dangers are concealed as a matter of degrees and therefore responsibility is placed on the user not to be oblivious to what is around him. In this way, not only the actions or ommissions of the facility owner must be examined, but the actions and omissions of the user as well.

State of equipment

There have been a number of cases where the state of the equipment used by the recreation participant has been a major factor in the cause of injury. The facility operator, however, does not always feel that he is to blame for faulty equipment and consequently the courts must establish some guidelines by which to judge such cases.

The law does not always hold the facility operator accountable for all injuries resulting from faulty equipment. The law does expect him to act reasonably and interprets this legal duty, as follows:

> A person is not liable if he shows that he was acting in accord with general and approved practice.[36]

Therefore, renting equipment of a certain condition which has general approval or following an approved system of checking equipment would appear sufficient in preventing the operator from being liable for negligence due to equipment failure. The law, however, does not clearly state from whom approval should be sought. Undoubtedly, approval could come from many sources. Although one might consider the long use of equipment as a factor, the common law may not. For example, although a slide had been safe for a large number (69,149) of previous users, the courts judged the rubber padding at its end to be defective and therefore the operator was found negligent.

36. MacLeod v. Roe (1947) 3 D.L.R. 241.
37. McCarthy v. Royal American Shows Inc. 1967 64 D.L.R. (2d) 246.

Although reported cases have not dealt with all aspects of negligence resulting from faulty equipment in recreation situations, the above statements of law complement the general principles of negligence to indicate the viewpoint of the courts.[38]

Parks

A municipality has the duty to keep its parks in a reasonably safe condition. This includes the trimming of trees, the clearing of stumps from paths and even the placement of curbs where their absence can be foreseen as a danger.

> While a municipality is liable only for misfeasance as opposed to mere non-feasance, the failure to trim the bough of a tree, so that it projects over the street at such a height as to be struck by the top of a truck 11 feet, 10 1/2 inches high, is not mere non-feasance where the municipality planted and maintained the tree. The planting, maintenance and failure to trim must be regarded together.[39]

When deciding negligence in a park setting, the classification of the injured person under occupier's liability must first be determined:

> A visitor to a municipal park is not an invitee but a licensee and the licensor would be liable to him for injury sustained on the premises only if there was danger which was known to it but not to the licensee and which the latter could not be expected to avoid.[40]

Therefore, an unrepaired fence which is located in an unconcealed place in the park is not grounds for negligence if an injury occurs by falling on it.[41] The classification of licensee, however, does not apply if a person pays an admission fee when entering the park:

38. For cases of faulty recreation equipment see also, Balyne v. Sunnyside Amusement Co. Ltd. (1931) O.R. 549, 40 O.W.N. 335, (1931) 4 D.L.R. 487, (C.A.); Dezeil et al. v. Dezeil (1953) 1 D.L.R. 651.

39. Miller and Brown Ltd. v. City of Vancouver 56 D.L.R. (2d) 190.

40. Richardson v. The City of Windsor (1942) O.R. 1, O.W.N. 18, (1942) 1 D.L.R. 500. See also, Downs v. Hamilton and Dundas Railway Co. (1907) 10 O.W.R. 657.

41. Ibid.

> There is a higher duty owed to a person who enters premises under a contract than that which is owed to an invitee.[42]

Therefore, a lady tripping over a stump on a pathway during a teepee exhibition is cause to show negligence.

Several things may constitute an unusual danger in a park. For example, a park manager was found negligent when boys climbed a flag pole, causing it to buckle and injure spectators.[43] The manager had warned the boys not to climb on the pole and thus the unusual danger was forseeable. As well, the spectators were licensees and the duty was owed to them to protect them from this unusual danger. In another case, fifty per cent contributory negligence resulted from the failure to erect curbs at the outside boundary of a park at the base of a hill.[44] (A car rolling down the hill killed a man walking in the park.)

A municipality has the duty not to create an unusual danger even if it is acting to eliminate a more obvious danger.[45] The removal of boulders to widen a toboggan run made it possible for a toboggan to pass over a sudden four foot drop between the edge of a bank and a frozen river. This resulted in two accidents for which the city was liable.[46]

42. Finigan v. City of Calgary et al. (1968) 65 D.L.R. (2d) 626.
43. Booth et al. v. St. Catharines et al. (1948) 4 D.L.R. 686.
44. Richardson v. Toronto (1938) O.W.N. 46.
45. Hansen et al. v. City of Saint John et al. (1973) 39 D.L.R. (3d) 417.
46. Ibid.

Conclusions

As Youngblut (1975, pp.70-73) notes, all decisions of negligence stem from the general principles of determining the legal duty to take care. Legal concepts, such as occupier's liability, standard of care, foreseeability of harm and principles of established cases, may all play a role in a decision of negligence. A number of points are worthy of emphasis in conclusion.

The duty of supervisors of children is considered to be that of a careful parent. During recess, for example, general supervision is sufficient for the supervision of children. A parallel situation could apply to playground supervisors during summer municipal playground programmes.

The duty of the occupier of premises which the public may rightfully use is to maintain the premises in a reasonably safe condition. Some system of checking for forseeable dangers (e.g., icy steps, water, debris, broken equipment) should be instituted.

The obligation of the facility owner is to keep users only reasonably safe, not perfectly safe, even under the fullest relation of duty. A facility owner is, therefore, not responsible for all injuries within his facility, but only those in which he has shown a lack of care. An owner or administrator must provide competent supervision when participants are involved in sports where there is forseeable danger as a result of lack of competance. This has applied to the lack of competent instructors and lack of adequate instruction.

Signs limiting liability have no validity unless stated clearly and in specific terms.

A recreation facility operator is not responsible for faulty equipment if his equipment checks correspond with approved practices. The long safe use of

equipment is not a guarantee that it is legally safe.

The duties of supervisors of municipal programs are comparable to those of a teacher. When general supervision is being questioned, the issue of forseeability of harm is a discussion point.

A person using a municipal park is a licensee and, consequently, the municipality is required to protect the person from hidden or unusual damages.

Youngblut (1975, p.75) makes three recommendations that are of interest here:

1) that participants do not maintain the attitude that the facility operator is responsible for all accidents occurring within the facility. It has been shown, for example, that acting in a manner oblivious to what is around the participant is a contributing factor in a number of injuries;
2) that facility owners, when using or renting a new style of equipment, should seek a professional group or association (e.g., Canadian Standards Association) to approve the equipment and the manner in which it is used; and
3) that more emphasis be placed by instructors, promoters of an activity, and individual participants in the activity, on giving participants sufficient understanding of the safety rules and practices of the activity in which they participate.

Recorded lawsuits

There are very few instances of successful lawsuits with respect to accidents on children's playgrounds, despite Rhind's (1974, p.18) comment about the perceived difficulty of building adventure playgrounds as follows:

> One of the prime difficulties is that it seems to be a predisposition of Canadian parents to sue the government if anything (bad) happens.

Quite simply, there is no evidence to support this statement.

One of the leading experts on the law and recreation, van der Smisson notes that

> ...most accidents occurring on playgrounds are not design related...I have been following the liability field in public recreation now for a number of years and have tried to assemble all of the liability cases for schools and public agencies, and this includes playgrounds. The cases that are brought are due primarily to the lack of maintenance, rather than design.[47]

No detailed survey of Canadian municipalities has ever been conducted, but contact with a number of municipalities[48] indicates that very few lawsuits about public playground accidents have ever been instituted, let alone won.

47. Personal communication, December 18, 1975.

48 The City of Toronto and the Boroughs of East York, Etobicoke, North York, Scarborough and York.

SUMMARY

The original mandate for this project was to compare the safety of adventure and creative playgrounds as opposed to traditional playgrounds. It did not prove possible to address this specific problem in other than a preliminary fashion, simply because the data on this topic have not been gathered or are not readily available. The purpose of the study was, therefore, broadened to the examination of the issue of the safety of children's formal play environments in public settings in general.

There are two prime factors in accident prevention in any setting: protection and education. When dealing with children and their play environments, emphasis must be placed on protection. Safety education is also important, but it decreases in effectiveness the younger the child. It is, therefore, the responsibility of agencies planning and providing children's play environments to protect children from obvious dangers. It is possible to create an environment which is perfectly safe simply by avoiding risk. The problem is, however, that such a setting would not make a good play environment because it would lack many of those elements necessary for meaningful play: variety, complexity, challenge, risk, flexibility, adaptability, etc. Such playgrounds would go largely unused. Indeed, this is the case with many of the traditional playgrounds now in existence. This lack of use gives such playgrounds the appearance of being safe: few accidents are recorded, but few children use the playgrounds. A number of other cautions are also noted about dealing with safety data, e.g., the meanings of "accident" and "safety", seriousness of accidents, causal factors, locations, type of equipment, variability in reporting, etc.

There are two goals in any safety programme:

(1) eliminate serious injuries (e.g., strangulations, skull fractures, concussions, causes of death and dismemberment); and (2) minimize minor injuries (e.g., broken bones, abrasions, lacerations, punctures). Five ways are suggested of meeting these goals: (1) eliminate obvious sources of danger (e.g., sharp edges, protrusions, hard surface materials); (2) construct equipment from safe, durable materials; (3) install and maintain the equipment properly; (4) educate children about safety and supervise them where necessary; and (5) adopt performance standards, which apply to all playground equipment, based on potential hazards.

There is no denying the fact that children do have accidents on playgrounds, but then children have accidents in many places and in many ways. The data available indicate that playground equipment accidents represent less than 2.0% of all children's accidents and account for very few deaths. From an overall safety point of view, therefore, children's play equipment is not a major problem. Every attempt, however, should be made to understand the causes of those playground accidents that do occur and to minimize them.

Various studies indicate that playground equipment accidents are approximately evenly split between private and public settings. There is evidence that some private equipment, particularly swings, are disportionately unsafe.

There is no evidence to suggest that adventure and creative playgrounds are more dangerous than traditional playgrounds. This is an area which warrants extensive further study.

Detailed examination of playground accidents indicates that care must be taken in defining the cause of individual accidents. Many accidents recorded as "playground" accidents are not related in any way to the playground <u>per se</u>

in terms of the design, maintenance or use of the equipment itself. For example, the major causes of accidents on playgrounds include broken glass, bicycles, sports, general "horseplay", and fighting. Even for those accidents related to the equipment itself, causative factors are often complex. For example, many accidents are caused by children pushing other children or just simply not being careful or not using the equipment in ways for which the equipment was intended and designed. Indeed, few accidents can be directly related to equipment design, equipment failure, maintenance, or construction.

The available data simply do not give a comprehensive picture of playground accidents in terms of either morbidity or mortality, largely because of the complexity of the problem. In summary, the part of the body most frequently injured is the head, face or neck area; the most frequent type of injury is laceration or abrasion; and the most common contributing factors to the injury are that the child has fallen for one reason or another or that there was a moving impact (i.e., bumps and blows).

There is some evidence to suggest trends in accidents from various types of equipment. The number of injuries associated with swinging elements has become significantly lower, perhaps as a result of an increase in the number of rubber belt-type seats or rubber tire seats. The number associated with climbing apparatus has significantly increased, perhaps as a result of the greater number and variety of such equipment. There have been no significant changes for sliding equipment, seesaws, and other non-specific equipment.

Perhaps the most serious causal factor in playground accidents is the surface material under the equipment. Other research indicates that asphalt and concrete are totally unacceptable as surface materials. Gym mats would be acceptable, but are not suited for outdoor use. Packed earth is not acceptable,

and sand only marginally acceptable. Cocoa shell and pine bark show excellent energy absorbing qualities, but are not conducive to walking or durability. They could be considered for high injury rate locations. Wood chips are good energy absorbers, but get wet, rot and are easily dislodged. The best choices are rubber mats or pea gravel.

It is quite obvious that the issue of safety has had observable impacts on a number of areas with which agencies involved in children's formal play environments are concerned: planning and provision; maintenance; and programming and supervision. Too often, inadequate formal play environments for children are provided because good design, plans and equipment are modified or rejected based on an overreaction to or misconceptions about what is needed to provide a safe environment, and how safe a playground should be to provide sufficient value to children.

In terms of planning and provision, there have been a number of obvious impacts. First, there seems to be a widespread belief that creative and adventure playgrounds are more dangerous than traditional playgrounds. Quite simply, there is no evidence to support this view, but there is still a tendency for agencies to prefer traditional playgrounds. Second, there has been an impact on location. There has been a tendency to locate playgrounds away from busy streets or other conflicting uses within a larger park. Such actions are understandable, but there is no evidence to suggest that there have been effects on accident rates. Third, safety considerations have often prohibited or restricted the development of one or more of the developmental functions -- physical, social, cognitive, and emotional -- of play environments. Fourth, the layout of activity zones and functional areas has been affected. Activity zones or apparatus should be located far enough apart to ensure that activity in one

zone will not interfere with activity in an adjacent zone. Similarly, circulation patterns should be planned so that dangerous flow patterns of children do not exist. Often, this concept is taken to its extreme: the equipment is so widely separated that functional linkages between pieces of equipment are disrupted. Finally, there have been many important effects on the selection and design of apparatus. These include: modification of some well-established types of equipment (e.g., rubber seats for swings, lower slides); continued reliance on steel equipment; the tendency to choose established and time-tested equipment; improved installation techniques; avoidance of high equipment; avoidance of moving equipment; avoidance of overhead linkage or circulation systems; avoidance of hard surface materials; avoidance of enclosed structures; avoidance of water and fire as aids to play; avoidance of certain types of equipment found to be related to accidents (e.g., teeter-totters, high slides, etc.); and discouragement of multi-seasonal use. It must be emphasized, however, that not all of these effects are based on factual safety data (e.g., avoidance of overhead linkage or circulation systems, innovate equipment, etc. or the acceptance of steel equipment). Such decisions are based to a large degree on a desire for safe environments, but are at best opinions based on personal beliefs and are seldom founded in fact.

The effects on maintenance are very great. Regular maintenance schedules are usually strictly enforced by the agencies involved. There is also a tendency to discourage winter use of many playgrounds in the belief that there is an increased danger. While some equipment has been designed so that winter use is not possible, there is no evidence to suggest that accidents increase during winter months.

In terms of programming and supervision, concerns for safety have resulted

in restrictions being placed on use: the lack of integration of playgrounds into children's recreation and education programs; the limiting of the numbers of users; and the restricting of types of activities. Re-evaluation of these actions should be made in light of the data presented on safety in this report.

In light of these findings, it is strongly suggested that performance standards for playground equipment be adopted. Performance standards are preferable to design standards because the focus is on hazards rather than specific pieces of equipment. Once a safety requirement is established based on performance, it can apply to any given piece of equipment. Such standards would depend on a number of testing factors: surface material, impact, abrasion, durability, function, costs, supervision, age grouping, labelling and use area. The safety requirements themselves would deal with the following: materials of manufacture and construction; edges, protrusions, and crush points; moving impact; entrapment; falls from equipment; surfaces under equipment; and maintenance, installation, and identification. Detailed suggestions, based on research conducted by the National Recreation and Park Association, are contained in the main body of the report.

Finally, a major area of concern for agencies planning and providing children's formal play environments is the issue of legal liability. There is some degree of uncertainty, however, because of the few legal precedents with respect to play environments. A number of concepts can be applied from liability cases in general and those dealing with other recreation settings in particular. The points are as follows:

(1) the duty of the supervisor of children is considered to be that of a careful parent;

(2) facilities must be maintained in a reasonably safe condition;

(3) a regular maintenance system is important;

(4) A facility operator is not responsible for all injuries within his facility, but only those in which he has shown a lack of care;

(5) competent supervision must be provided for sports in which there is a forseeable danger as a result of lack of competence;

(6) signs limiting liability must be clear and specific;

(7) a facility operator is not responsible for faulty equipment if his equipment checks correspond with approved practices;

(8) the long safe use of equipment is not a guarantee that it is legally safe;

(9) hidden or unusual dangers must be avoided.

The following recommendations are made:

(1) that participants do not assume that the facility operator is responsible for all accidents;

(2) new equipment should be professionally approved; and

(3) increased emphasis be placed on safety education.

It is important to note that, despite the number of playground accidents that have occurred, there have been relatively few lawsuits and few of these have been won.

In summary, it seems fair to suggest that, in terms of the overall picture of children's accidents, playgrounds are not a major safety concern. Accidents, however, do occur and will continue to occur, but that most accidents are caused by the operator of the equipment and are not a result of product or design failure. There are a number of means by which the number and seriousness of accidents can be reduced (e.g., changes in surface material, performance standards, safety education, supervision, improved planning), but some accidents will always occur on playgrounds. The question arises, however, as to how many more accidents would occur elsewhere (e.g., on the streets) if there were no playgrounds.

SUGGESTIONS FOR FUTURE RESEARCH

A number of possible topics for further research are suggested:

(1) a controlled study comparing safety on a relatively small sample of adventure, creative and traditional playgrounds;

(2) an in-depth, post-accident study of the nature and causes of individual playground accidents, including on-site investigation of the playground involved;

(3) a survey of existing playgrounds to measure levels of playground equipment maintenance and hazards;

(4) an evaluation of current playground equipment designs in light of performance standards;

(5) an investigation of playground safety education and of playground supervision training, with the goal of improved package programmes;

(6) a study of the use and misuse patterns of particular types of equipment, with a goal of improved equipment design;

(7) a study of the play patterns in general of children including an examination of the role of various types of playgrounds and also examining the issue of winter use of facilities;

(8) the development of guidelines for playground plan evaluations in terms of safety including information on what is needed to provide a safe play environment, how safe a play environment needs to be, and the effect of a play environment that is <u>too</u> safe in terms of the potential functions of playgrounds in general;

(9) the development of a set of testing standards by which the developmental functions (i.e., physical, social, cognitive, and emotional) of particular types of equipment can be evaluated and improved;

(10) a detailed study of current trends in the planning of playgrounds and of the construction and selection of playground equipment.

APPENDIX: SOURCES OF INFORMATION

M. Jacques Auger, Directeur, Service de la Planification, Haut-Commission à la Jeuness aux Loisirs et aux Sports, Ministère de l'Education, Gouvernement du Quebec, Québec.

Mr. Douglas Balmer, Toronto Board of Education, Toronto.

Dr. Kenneth Balmer, Department of Recreation, University of Waterloo, Waterloo.

Mr. James D. Bayer, Director of Operations, Nova Scotia Department of Recreation, Halifax.

M. Yves Belanger, Sous-Ministre Adjoint et Director-Général, Haut Commissariat à la Jueness aux Loisirs et aux Sports, Quebec.

Mr. Arvid Bengtsson, President, International Playground Association, Goteborg, Sweden.

Ms. Mickey Bongers, Institute for Child Studies, University of Toronto, Toronto.

Mr. Robert Bornhold, Midwestern Ontario Region, Ontario Ministry of Education, Waterloo.

Dr. David M. Boswell, Director, Youth, Fitness and Recreation, Prince Edward Island Department of Education, Charlottetown.

Ms. Jean Braaten, Ontario Association for the Mentally Retarded, Toronto.

Mr. Charles G. Brown, Director and Secretary, Metropolitan Toronto School Board, Toronto.

Ms. Denys Brown, Community Relations Branch, York University, Toronto.

Ms. Barbara Bryan, Recreation Canada, Canada Ministry of Health and Welfare, Ottawa.

Mr. J. H. Budd, Big Toys Ltd., Don Mills, Ontario.

Mr. Robert D. Buechner, Project Director, National Recreation and Park Association, Arlington, Virginia.

Mr. J. Carmichael, Legal Department, City of Toronto, Toronto.

Mr. Allan Clark, Co-Ordinator of Special Services, Nova Scotia Department of Recreation, Halifax.

Mr. Barry Coopersmith, Department of Parks and Recreation, Ottawa.

Ms. Susan Cope, Children's Environments Advisory Service, Central Mortgage and Housing Corporation, Ottawa.

Mr. Jerry Corush, J.S. Corush Associates Ltd. (Landscape Architects), Ottawa.

Mr. Michael Coxon, Community Development Office, Ontario March of Dimes.

Dr. C. A. R. Dennis, Prairie Institute for Environmental Health, Regina.

Mr. Russell Dobbins, Scottish and York Insurance Co. Ltd., Toronto.

Prof. Diana Dunn, Department of Health, Physical Education and Recreation, Temple University, Philadelphia.

Dr. Michael J. Ellis, Director, School of Physical Education, Dalhousie University, Halifax.

Mr. Ewan, Finance Department, Borough of Etobicoke.

Mr. Donald Fletcher, Director of Sport, Sport Directorate, Manitoba Department of Tourism, Recreation and Cultural Affairs, Winnipeg.

Mr. Ivan B. Forrest, Commissioner, Department of Parks and Recreation, City of Toronto.

Mr. Ronald Foster, Department of Parks and Recreation, City of Toronto.

Ms. Joan Gauthier, Western Ontario Region, Ontario Ministry of Education, London.

Dr. Vera Gellman, Consumer Standards Directorate, Product Safety Branch, Canada Ministry of Consumer and Corporate Affairs, Ottawa.

Ms. Jacquie Gould, North Area Co-ordinator, Department of Parks and Recreation, Borough of Etobicoke.

Ms. Helen Haffey, Head, Records and Statistics Office, Toronto Sick Children's Hospital.

Mr. John Hamada, Landscape Design Branch, Department of Recreation and Parks, Scarborough, Ontario.

Mr. H. E. Hartley, H. E. Hartley Consultants, Toronto.

Mr. James Hayward, Superintendent of Parks, North York, Ontario.

Mr. D. C. Henderson, Board of Education, Borough of Etobicoke.

Mr. E. Heyes, Director of Recreation, East York, Ontario.

Mr. A. J. Higgs, Superintendent of Parks, Etobicoke, Ontario.

Ms. Polly Hill, Children's Environments Advisory Service, Central Mortgage and Housing Corporation, Ottawa.

Mr. Ian Hunter, Chief Engineer, Board of Education, City of Toronto.

Mr. Peter James, Public Relations Branch, Canadian Standards Association, Toronto.

Mr. Elwood Junkin, Midnorthern Ontario Region, Ontario Ministry of Education, Sudbury.

Mr. John J. Keay, Commissioner, Scarborough Recreation and Parks Department.

Ms. Jane Knight, Director, National Task Force on Children's Play, Canadian Council on Children and Youth.

Mr. William Knott, Leadership Branch, Ontario Ministry of Culture and Recreation, Toronto.

Ms. Adele Kon, Department of Parks and Recreation, Sudbury, Ontario.

Ms. Jane Leat, Parks Department, Etobicoke.

Legal Department, Borough of York.

Legal Department, Borough of Scarborough.

Legal Department, Borough of North York.

Legal Department, Borough of East York.

Mr. Colin MacLeod, Lennox and Addington County Board of Education, Napanee.

Mr. Barry Macklin, Recreation Department, North York, Ontario.

Mr. E. Macmillan, Community Relations Branch, Ontario Housing Corporation, Toronto.

Bal M. Majahan, Product Systems Section, U.S. Department of Commerce, National Bureau of Standards, Washington, D.C.

Ms. Nancy Mallet, Vice-Principal, Dewson Street Public School, Toronto Board of Education.

Mr. Richard Manser, Northwestern Ontario Region, Ontario Ministry of Education, Thunder Bay.

Mr. Thomas McCann, Chairman, Department of Design, Seneca College, Toronto.

Mr. Patrick McGarrity, Eastern Ontario Region, Ontario Ministry of Education, Kingston.

Mr. Neil Melman, Department of Parks and Recreation, York, Ontario.

Ms. Cathy Morrison, Department of Parks and Recreation, York, Ontario.

Ms. Jane Neat, Parks Planner, Etobicoke Parks Department.

Ms. Susan Novak, Assistant to the Advisor, Children's Environments Advisory Service, Central Mortgage and Housing Corporation, Ottawa.

Mr. Marius Ois, Architecture Office, Ontario Housing Corporation.

Outdoor Learning Centres Committee, Board of Education, North York, Ontario.

Mr. J. H. Panton, Director, Leisure Services Branch, British Columbia Department of Provincial Secretary, Victoria.

Dr. Victor Papanak, School of Industrial Design, Carleton University, Ottawa.

Paris Playground Equipment, Paris, Ontario.

Mr. J. Olivier Pelletier, Ottawa Valley Region, Ontario Ministry of Education, Ottawa.

Ms. Marilyn Reid, Department of Planning and Evaluation, Board of School Trustees, Vancouver.

Mr. George Rolfe, Office of Design, Canada Ministry of Industry, Trade and Commerce, Ottawa.

Mr. Leonard Ryan, Manager, Central Recreation Services, Board of Parks and Recreation, Vancouver.

Ms. Shirley Schell, Department of Parks and REcreation (Elmbank Community School), Borough of Etobicoke.

Ms. Alexandra Semeniuk, Leadership Branch, Ontario Ministry of Culture and Recreation, Toronto.

Mr. Emmett Smith, Assistant Deputy Minister, Recreation Development, Alberta Department of Recreation, Parks and Wildlife, Edmonton.

Ms. Betty Steinhauer, Muirhead Public School, North York Board of Education.

Ms. Jean Stevenson, Day Nursery Branch, Ontario Ministry of Community and Social Services, Toronto.

Mr. Douglas Stone, East Area Co-ordinator, Department of Parks and Recreation, Borough of Etobicoke.

Mr. R. I. Thorman, Comptroller of Finance, Metropolitan Toronto School Board.

Mr. William Townshend, Waterloo County Board of Education, Waterloo.

Prof. Betty van der Smissen, College of Health, Physical Education and Recreation, The Pennsylvania State University.

Dr. Otto Weininger, Ontario Institute for Studies in Education, Toronto.

Dr. Peter Witt, Department of Recreology, University of Ottawa, Ottawa.

Mr. Peter Youngblut, Bronte Sports Training Centre, Ontario Ministry of Culture and Recreation, Burlington.

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